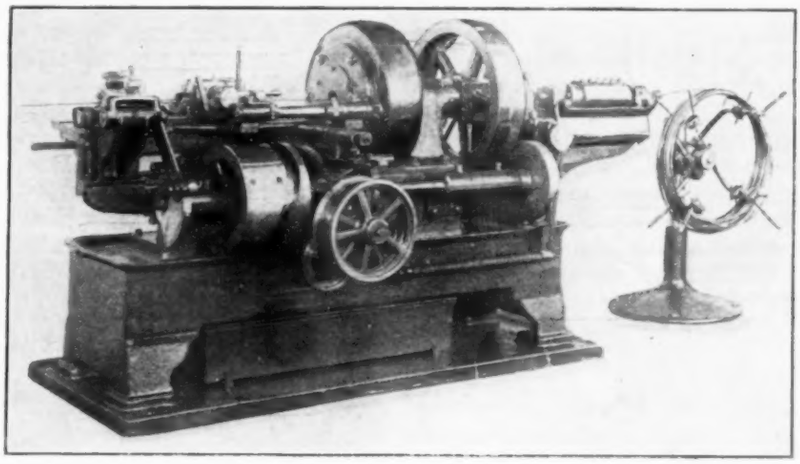
September 25, 1919 American Machinist Vol. 51, No. 13

# The Langelier Line of Special Machinery

By K. H. CONDIT
Associate Editor, *American Machinist*

***The building of special machinery to the customer s order is a fascinating business and bears little similarity to the construction of standard machine tools in quantity. The designer is given freer rein so that originality is at a premium. The line of special tools here described is quite typical of this tendency and shows the trend of the present market toward the automotive manufacturers who are busier than ever.***



THE greatly curtailed production of automobiles during the period of the war has naturally resulted in a large demand for vehicles of all kinds and consequently in strenuous endeavors on the part of the manufacturers to satisfy it. They are anxious for time- and labor-saving automatic machines and welcome any new machine tool, no matter how limited its application. The Langelier Manufacturing Co. of Providence, R. I., makes a business of building special machines for such purposes and has just introduced the swaging and drilling machines described, for jobs on pistons, valves, wire spokes and crankshafts.

The headpiece and Fig. 1 show both sides of an automatic swaging machine for making the spokes of automobile wire wheels. This machine uses some of the features of a bicycle-spoke swaging machine built by the company several years ago but they have been re-designed, added to and rearranged to form an entirely different and greatly improved assembly.

The essential parts of the spoke swaging machine are the wire reel, wire straightener, swaging head, automatic feed and automatic cutting-off device. The construction of the reel is shown in the illustrations and is so simple that nothing further need be said about it. From it the wire stock passes to the wire straightener *A*, Fig. 1, where it passes through stationary tapered bushings located concentrically within adjustable anti-friction bearings. The wire comes from this straightener unmarked and passes through a stuffing-box to the swaging head. The purpose of the stuffing-box is to retain the swaging oil which is pumped on the wire at this point from the oil feed pump *B*. This pump also supplies the swaging mechanism through a branch pipe. The wedges which close the swaging dies are actuated by the face cam and lever at the right end of the countershaft as shown in the headpiece. The surplus oil overflows the bottom of the hole *C*, Fig. 1, and runs down into the drip pan *D* where it is filtered and returned to the pump.

The feeding mechanism is driven by the high- and low-speed and idle pulleys shown in the center of the headpiece, through spur gearing to the wormshaft which drives the camshaft by a worm-wheel. The motion of the sliding chuck is obtained from the track cam whose roller follower is mounted on a sliding block *E*, Fig. 1. Attached to the sliding block, the travel of which is adjustable, is a pin which forms a pivot for the sliding block in the vertical slot in the sector *F*. The sector operates a rack which moves the sliding chuck and is provided with a spring take-up for emergency. Quick return of the sliding chuck is obtained by shifting the belt on the driving pulley with a shifter actuated by a track cam and roller follower. In case of trouble the belt can be shifted to the idle pulley by hand lever *G*. The jaws of the chuck are opened and closed by strikers on a rock shaft driven from the countershaft by a face cam.

The cutting-off device consists of a shear operated by a pair of spur sectors. Eight holes are tapped in the guides for the holding-down capscrews of the shear bracket thus giving eight different positions. To allow for this adjustment the driving segment *H* is made 10 in. long while the driven segment is about 2 in. A disk cam and roller type lever follower operate the driving segment. This machine takes wire of 0.176-in. diameter, reduces it to 0.156-in. diameter between butts and cuts off spokes of lengths from 8 to 12½ in. The production rate is three spokes per minute.

Figs. 2 and 3 show two views of a machine for swaging the stems of the poppet valves of automobile, marine or stationary gas engines. The machine is not new in principle but differs from the older Langelier machine built for the same work in having automatic feed. Examination of the illustrations will show that the details of this swaging machine are very much the same as those of the spoke swaging machine just described, except that the chuck is operated by hand instead of automatically. The lubrication systems of both machines are similar as are the main and feed drives. The parts of the valve swaging machine are, of course, somewhat heavier because of the larger diameter of the work.

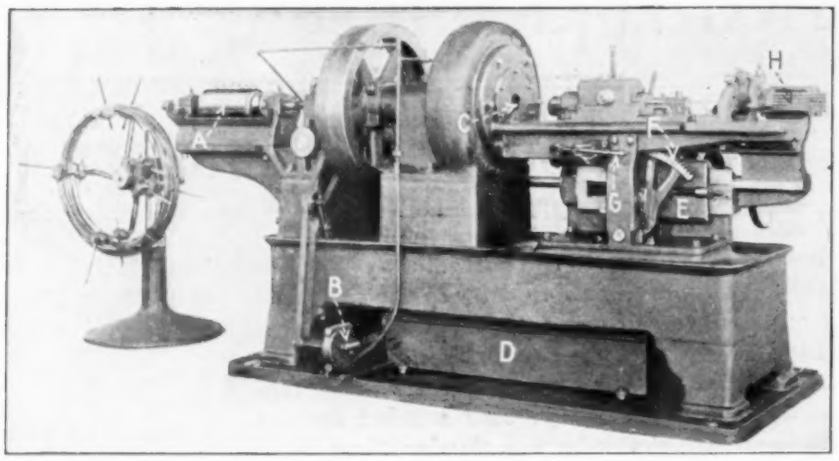



FIG. 1. AUTOMOBILE WIRE-SPOKE SWAGING MACHINE

The possibilities in swaging valve stems seem to have been overlooked to a considerable extent. This machine will turn out work ready for finish-grinding at the rate of 1½ valves per minute of the size shown in Fig. 4. The usual practice is to grind the stems to final size but this seems hardly necessary in view of the accuracy attainable by proper arrangement of the swaging process. The swaging work is shown complete in two operations in Fig. 4 but according to the Langelier engineers one more swaging operation could be made to replace the final grinding with an appreciable saving of time.

### Crank-Arm Oil-Lead Drilling Machine

Fig. 5 shows another special tool for automotive work. It is a horizontal four-spindle drilling machine designed for the single job of drilling simultaneously the oil holes in a four-cylinder automobile-engine crankshaft which connect the crankpins to the main journals. The layout of the work is given in Fig. 6 where the angle and center distance of the ¼-in. holes are shown as well as the arrangement of holding jig and guide bushings. The drills enter the work at the same time but those at the left are withdrawn just before they reach the center, leaving the right-hand ones to break through and complete the passage. On the completion of the first pair of holes the crankshaft is turned end for end in the fixture and the remaining two are drilled in the same way.

Each drilling head has two high-speed spindles driven by a single belt at 1800 r.p.m. The hardened and ground spindles run in phosphor-bronze bearings and are attached to the feed yokes by clamps so that they may be adjusted as the drills wear down. The spindle pulleys run on stationary sleeves anchored in the drill-head casting so that no pulling strain can come on the spindles to affect their alignment. Each pulley runs on two radial ball bearings. The spindles in each head are fed by single, two-headed feed yokes, the one on the right being connected through gearing to a large feed pilot handwheel. The one on the left is operated by a feed bar with an adjustable feed-releasing mechanism which can be set to throw out the feed just before the drills reach the center of the work for the reason mentioned before.

The cutting lubricant is supplied to the drills from a rotary pump through piping and holes in the baseplate of the fixture which lead to the guide bushings. The fluid is directed into the drilled holes from these points. A valve in the feed line operated by the main drill feed bar allows the cutting lubricant to flow only when actual cutting is in progress. The excess fluid passes through perforated plates in the bed which separates the chips and also through a filter before it returns to the pump for recirculation.

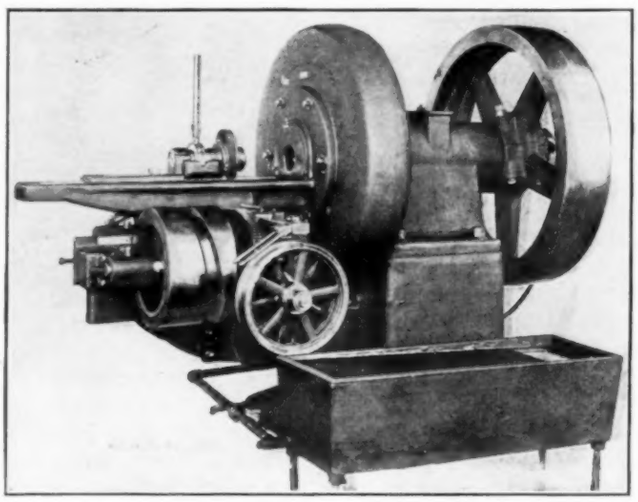


FIG. 3. VALVE SWAGING MACHINE—BELT SIDE

Generous lubrication of fast-moving parts has been provided for. The machine is so simple and so nearly automatic in its operation that ordinary unskilled help can produce an output of 12 crankshafts per hour. The drills are held by Jacobs chucks.

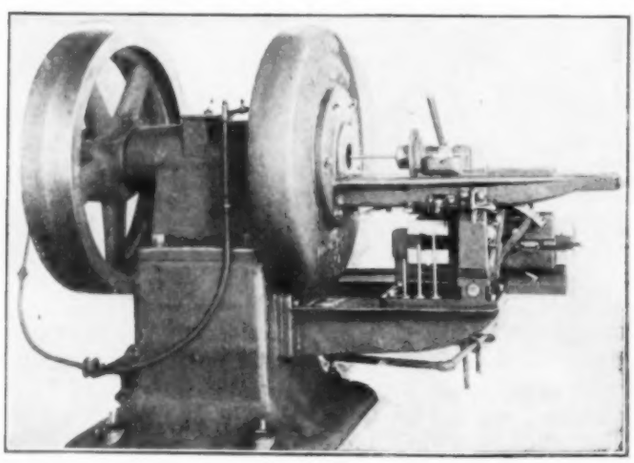


FIG. 2. VALVE SWAGING MACHINE—OPERATING SIDE

### Six-Head Angular Piston Drilling Machine

A somewhat more elaborate machine for the same type of job is shown in Figs. 7 and 8. The function of this machine is to drill simultaneously all the oil holes in an ordinary automobile trunk piston. A cross-section of the machine showing the work and the holding jig is given in Fig. 9. Six two-spindle drilling units, each with its own driving motor of ½ hp., are equally spaced around a hollow upright central column which

is bolted to a box base. Each drilling unit has two parallel drilling spindles inclined at an angle of 30 deg. to the horizontal and converging radially to the center of the piston. The spindles are hardened and ground, run in phosphor-bronze bushings and are driven by separate belts inclosed in metal guards. In this machine as in the one just described, the spindles are attached to the yokes by clamps and the drive pulleys are so mounted that no strain comes on the spindles to make them run out of line.

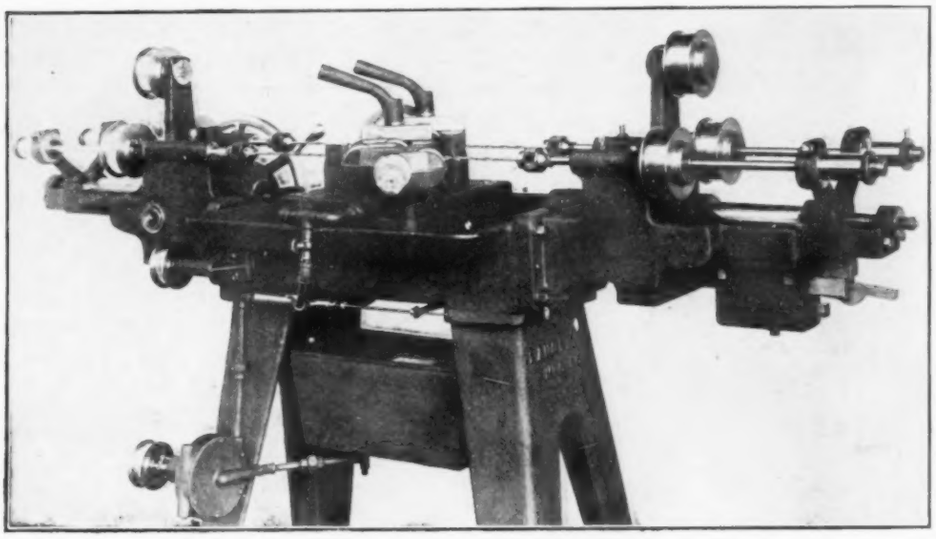


FIG. 5. CRANKSHAFT OIL-LEAD DRILLING MACHINE

All 12 spindles are fed into the work simultaneously by the handwheel *A*, Fig. 8, which is geared to a revolving cam ring concentric with the main central upright and carrying six segment spiral racks to actuate the feed yokes. The jig *B* is simply a hollow sleeve into which the piston is inserted, the bore having four hard steel runners to hold the piston in position after it has been located by a special locating pin in the side of the jig operated by a thumb lever. At the bottom of the jig is a tripod, attached to the foot pedal *C*, for supporting the work. When the job is complete and the drills have been withdrawn, the work can be removed readily by depressing the foot pedal which raises the tripod and piston clear of the drill ends. The drill bushings are carried in the jig as shown in the cross-section, Fig. 9.

The machine has a pump, tank and strainer outfit for delivering the cutting lubricant to the drills. A single branch pipe from the pump which is driven by its own electric motor leads the fluid to a distributing head at the top of the jig which forces a solid sheet of the liquid against the interior of the jig, keeping it washed free from chips and flooding the drill. A shut-off valve operated by the feed of the machine stops the flow when the drills are not cutting. The overflow is caught in the drip pan, strained and returned to the reservoir and pump. The output of this machine is three pistons per minute.

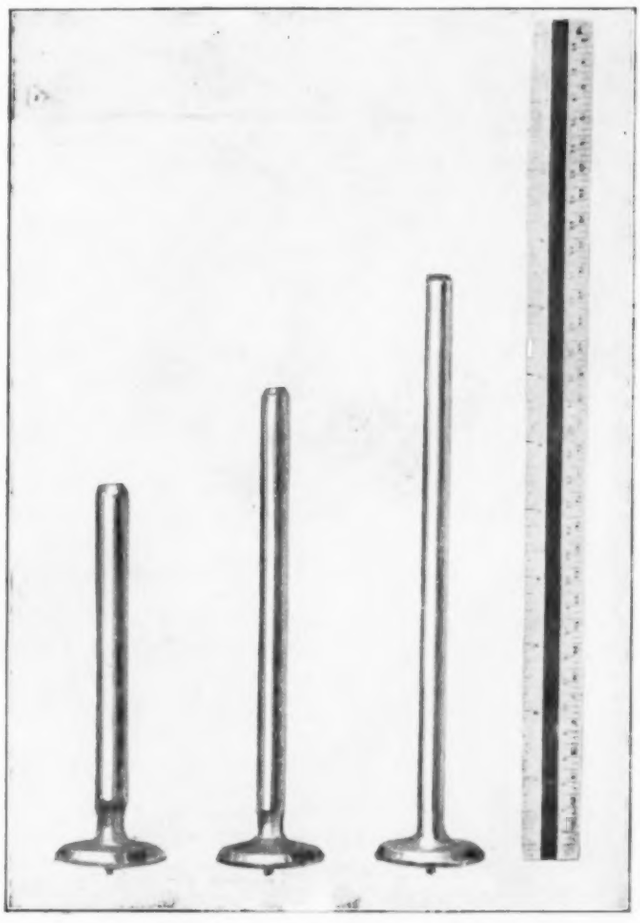


FIG. 4. STEPS IN AUTOMOBILE VALVE SWAGING

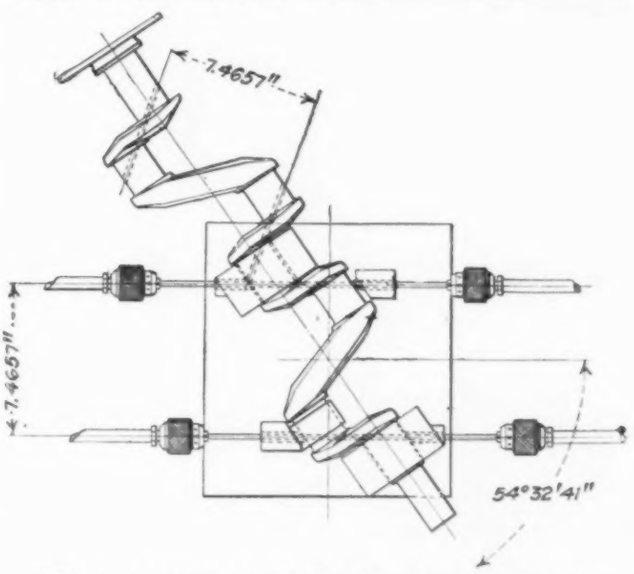



FIG. 6. LAYOUT OF WORK AND DRILLING HEADS

The Langelier Manufacturing Co., however, does not limit its output to machines for the automotive industry alone. In Fig. 10 is shown a two-spindle automatic drilling machine for drilling a hole for the flexible connection through the copper-carbon commutator brush of a dynamo-electric machine.

The work is fed through the vertical magazine *A*

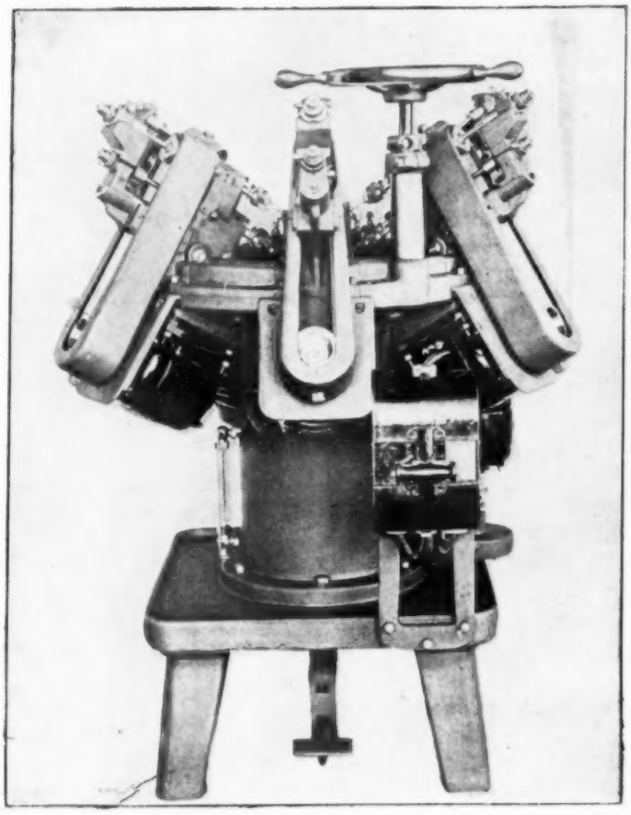


FIG. 7. PISTON OIL-HOLE DRILLING MACHINE SHOWING STARTER

to four recesses *B* in the periphery of the hollow drum *C*. They are held tangentially by the lever *D*, the inner end of which is actuated by rolling over a stationary cam, and radially by a curved guard which does not

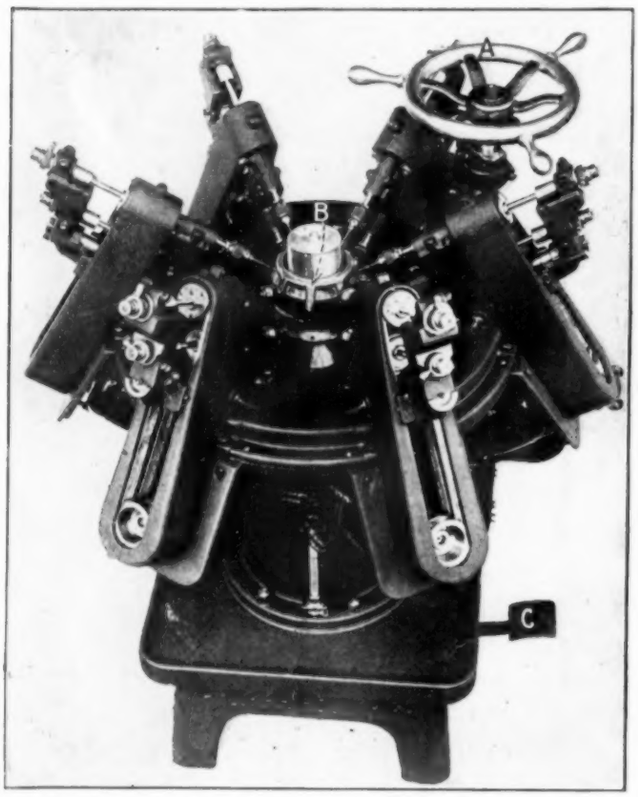



FIG. 8. PISTON OIL-HOLE DRILLING MACHINE SHOWING JIG AND WORK

appear in the illustration. Rotation of the drum through 90 deg. brings the work opposite the drilling heads as shown in Fig. 11 at which point a spring-operated plunger is released and pushes radially on the work, holding it firmly until the completion of the drilling. Further rotation of the drum permits the finished work to drop into the delivery chute *E*, Fig. 10.

Power from a 3-in. belt is delivered to the drive shaft at 600 r.p.m. through a Johnson friction clutch operated by the lever *F*, and the drill spindles are driven at 3200 r.p.m. by two 1-in. belts. The handwheel *G* on the wormshaft is used for adjusting the

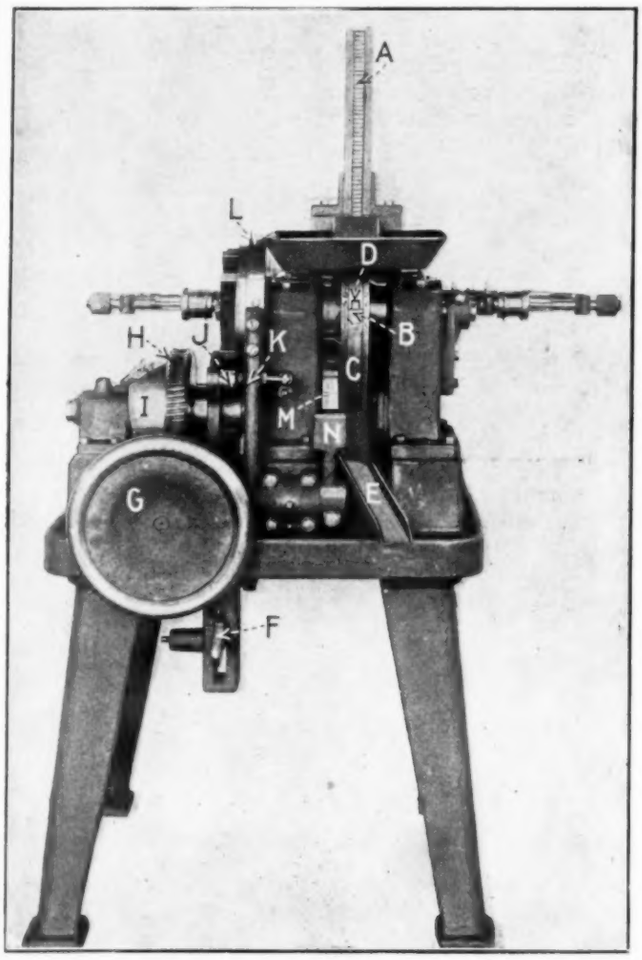



FIG. 10. AUTOMATIC DYNAMO-BRUSH DRILLING MACHINE

machine and is readily removed. The worm engages the wormwheel *H* which carries the track cam *I* for operating the drill feed yoke, and also the pin *J* for turning the feed drum by means of a four-arm Geneva motion. There is a certain amount of play in the Geneva motion and consequently the drum is located and locked in the drilling position by a stop lever *K* with hardened-steel toe which engages notches in the disk *L*. The stop lever is actuated by a plate cam *M* and lever follower *N*.

The drill spindles have the clamping feature mentioned before to provide for wear and the left-hand one is withdrawn just before it reaches the center of the work so that it will not hit the right-hand one which finishes the hole. The drill yoke drive is through two racks and segments at right angles to each other and the spindles are fed by two face cams. The features

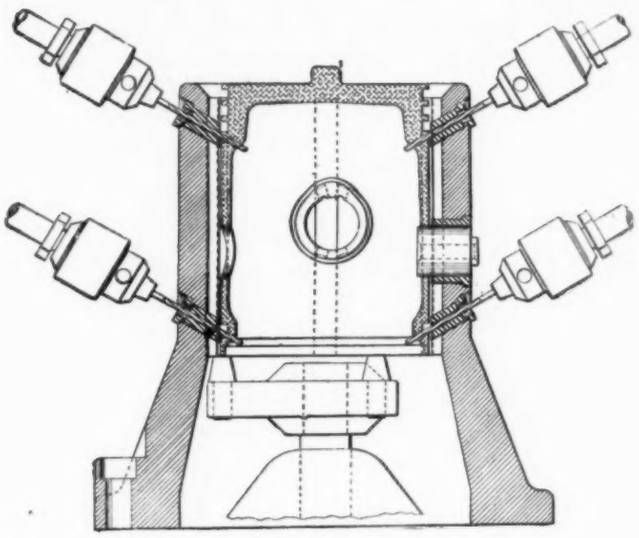


FIG. 9. CROSS-SECTION OF PISTON AND JIG

of the drill spindle arrangements described in the previous machines are included here.

Three other Langelier drilling machines appear in Figs. 12, 13, 14 and 15. The one in Fig. 12 is a multiple-spindle machine with a head arranged to drill the phonograph gear shown on the work table. The table is adjustable vertically and various arrangements of drill spindles within the capacity of the machine can be provided. These heads may be changed readily. The machine is equipped with a screw chuck for holding the work and arrangements for forced lubrication of the drills.

Fig. 13 shows a two-spindle sensitive drilling machine for typewriter parts. It has individual motor drive and both foot and hand feed. The arrangement of drilling heads and spindles is according to the standard practice of the company.

Figs. 14 and 15 show the standard sensitive drilling machine which has just been equipped with individual motor drive. It can be furnished with or without pedestal as shown.

These tools have been on the market equipped with belt drive for some time and have gained a favorable reputation. As will be seen from the illustration the motor support bracket has been designed as a separate unit so that it may readily be installed on the old belt-driven machines if desired.

The work of the Langelier Manufacturing Co. is typical of the change from war to peace conditions. During the war they built, among other machine tools for munition work, several multiple-spindle drilling machines for artillery fuses which embodied the basic principles which have been described in the foregoing paragraphs. With the cessation of hostilities they took the same proven principles and combined them in machines for peaceful purposes. The first ones naturally went to the busiest branch of industry, as has been mentioned, but as the other branches recover with the improvement of business conditions, the company will be in a good position to meet the requirements of all comers.

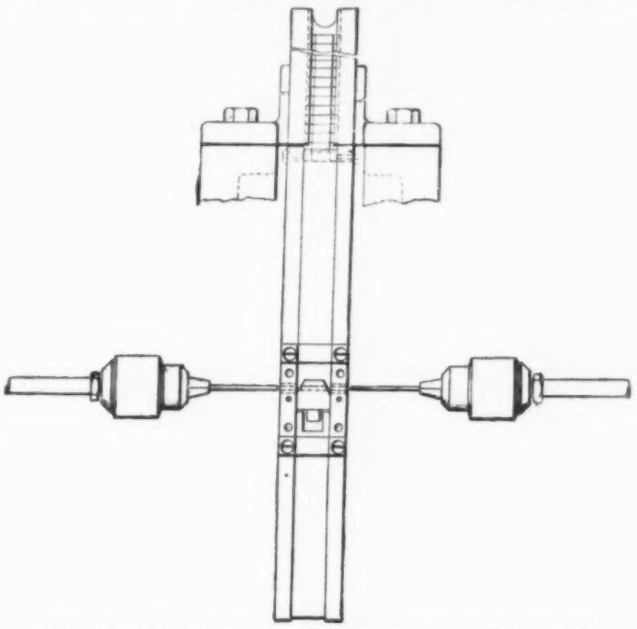
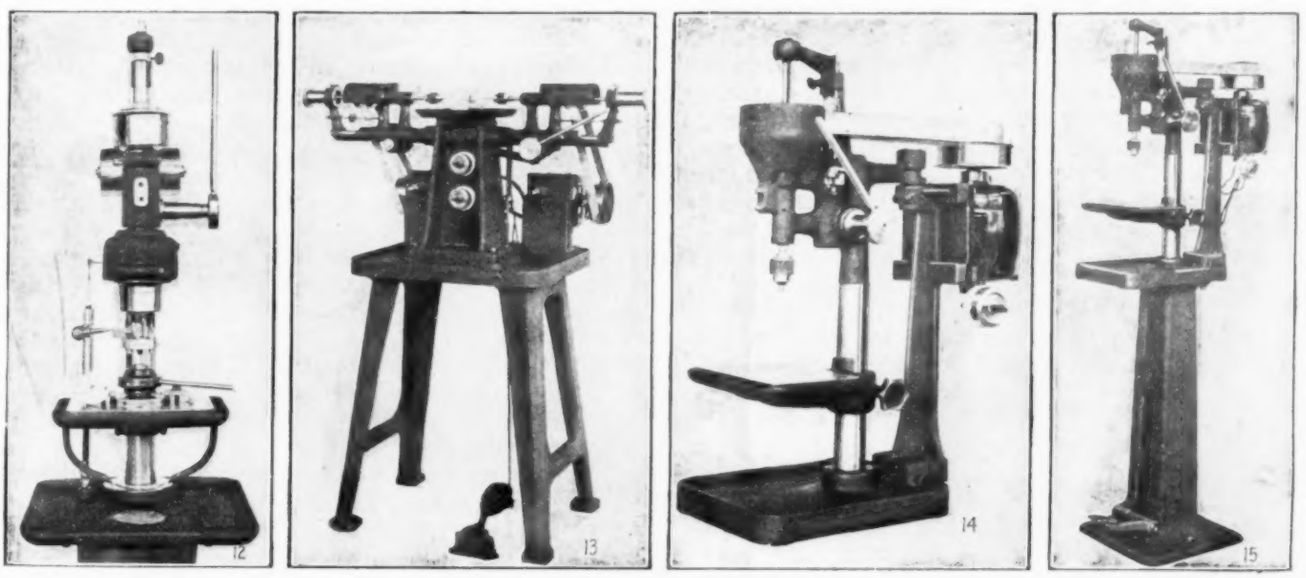


FIG. 11. WORK IN LINE WITH DRILLING HEADS




FIGS. 12 TO 15. VARIOUS DRILLING MACHINES

Fig. 12—Multiple-spindle, single-head drilling machine. Fig. 13—Two-spindle sensitive drilling machine. Fig. 14—Standard sensitive drilling machine. Fig. 15—Standard sensitive drilling machine with pedestal.

# The Engineer's Judgment of the Oxy-Acetylene Process of Welding*

By Alfred S. Kinsey†

Up to the advent of autogenous welding, the engineer had only his experience with the forge weld upon which to base his calculations and judgment. In a way this proved somewhat unfortunate for the new method of welding, as the forge weld had nearly lost its value as a dependable means of joining metals. Imagine two pieces of steel being brought to a soft plastic condition in a forge fire charged with sulphur from the fuel, an excess of oxygen from the blower, the cinders and refuse of the fuel, and one can readily realize the cause of weak forge welds. Such welds never were reckoned to have a tensile efficiency of more than about 50 per cent., and many observations of welds which had failed showed crystallization and even entrapped cinders. Navy yards and many other large shops had practically abandoned the forge weld, preferring the expensive substitute of machining a job out of the solid when it was possible to do so. Serious failures of forge welds were too common. The author recalls many of these, and particularly one regarding which he assisted in a suit for damages, where a hoisting hook had parted at the weld causing the death of a man. There was a demand for a safer and more efficient way to weld steel and wrought iron.

Before the advent of autogenous welding, the only metals which could be welded were wrought iron and steel. Then came autogenous welding and cutting by the oxy-hydrogen process, soon to be superseded by oxy-acetylene. From that time, practically only about 15 years ago, nearly the whole industrial world has eagerly watched the progress of the oxy-acetylene process.

The engineer recognized at once that there were certain fundamental principles involved in oxy-acetylene welding which were new to shop practice, such as:

## The Old and New Way

First, that autogenous welding was accomplished by fusion instead of plasticity. The old method required that the metal be heated merely to a soft pasty condition and then hammered or pressed together, while the new way was to melt the metal and flow the two ends into one mass. By the former method there could not be a thorough mingling of the grains of the metal because it was only plastic, and besides there was every opportunity for such a weld to receive gas and fuel impurities from the forge fire. By the new process there could be nearly perfect rearrangement of the grains due to the liquid condition of the metal. The mechanical engineer recognized at once, however, that while the fusion of castings for welding would be consistent with the method of their formation, that is, that both the original metal and the weld itself would be in the cast condition, this would not be true in the case of the welding of rolled or forged wrought iron or steel. There the two pieces of rolled or forged metal would be joined by a cast weld, the former being fine grained and strong, the latter of coarse grains and reduced tensile strength.

Second, that as fusion was the chief requisite of a good weld, the new process might be used to join other metals than wrought iron and steel. We have but to call to mind the work being done in the welding of iron castings alone to form an idea of the possibilities and value of the oxy-acetylene process for the welding of cast iron. The author recently had to do with the oxy-acetylene welding of three broken cylinders of freight locomotives, which cost $515 to weld and put in good working order, but would have cost $3600 to replace if oxy-acetylene welding had not been available.

Third, that the gases used in an oxy-acetylene torch operated by inexperienced welders might easily be made to lower the value of the weld. Many of the first oxy-acetylene welds were badly crystallized. The first designs of torches were much to blame for this condition, but the inexperience of the welder was more so. It is not unusual now to find oxy-acetylene welds so homogeneous as to make it practically impossible to see any difference between the original material and its weld.

Fourth, that unusual problems of expansion and contraction must be reckoned with in the job welded by oxy-acetylene. The cautiousness of the engineer in this regard may well be understood.

Fifth, that the heating of the oxy-acetylene weld was accomplished by the powerful quick-acting flame instead of a slow forge fire. What would happen if the metal were overheated?

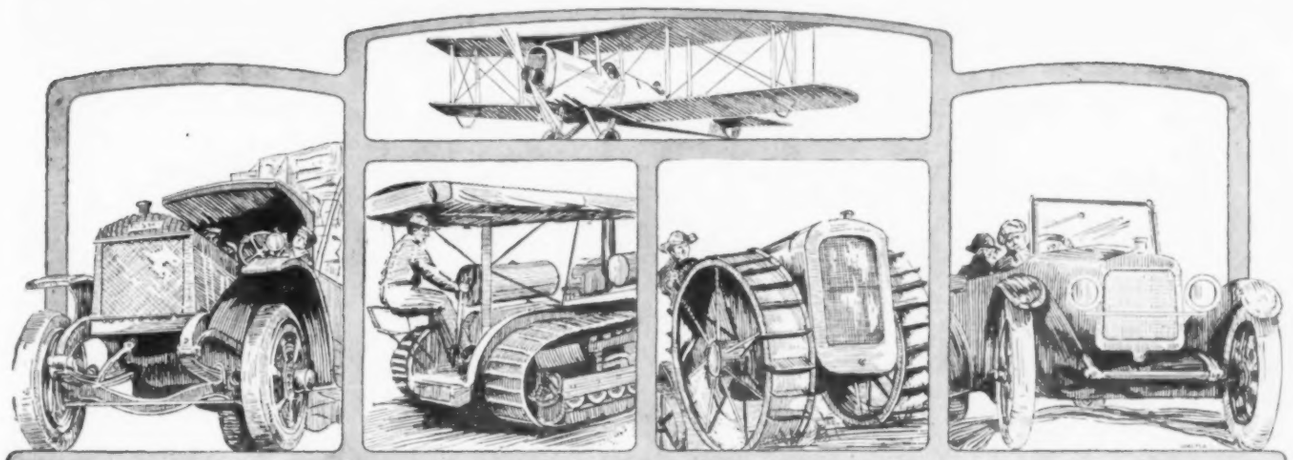
## Carefully Studied by the Technical Engineer

The technical engineer has been giving careful thought to the possibilities and advantages of oxy-acetylene welding. He has encouraged its trial in shop, foundry and manufacturing plant. He has studied its evolution from the rough joint of doubtful value to the homogeneous weld of nearly 100 per cent. efficiency. If he has been conservative in his judgment it was because he knew better than others of the undeveloped parts of the new field being entered by the welder; if he has appeared to be slow to accept the process for the most important high-pressure and high-tensioned work it is because he has waited to prove that the new welder could measure up to his increased responsibility. He will not forget the inherent crudeness of the work, nor the varying personal error of the best of workmen, and expect impractical refinements. A small fraction of sulphuretted hydrogen and phosphoretted hydrogen in the acetylene or a little difference in the purity of oxygen will not disturb his acquired confidence in the possibilities of a good weld by the new process. He has learned to appreciate the difference between a 50 per cent. plastic weld and 90 per cent. fusion weld.

The author has discussed oxy-acetylene welding with many of the leading engineers of the country, men who are in responsible charge of large engineering plants. Five years ago almost all of these men would have advised a delayed acceptance and further study of the advantages of the process. Today they do not hesitate. Their minds are made up. From study and experience they speak, and because of the nature of the heat supply which can easily be made a non-oxidizing reducing flame, because of the effect of the process on the physical efficiency on the actual weld, because of the portability of the welding apparatus, and because of the economy of the process, their judgment is that the oxy-acetylene process of welding metals is an engineering success and a fine commercial asset.

*Extracts from a paper read before the Annual Convention, International Acetylene Association, New York, July 15-17, 1919.

†Member of the A. S. M. E., Professor of Shop Practice, Stevens' Institute of Technology, and Advisory Engineer, Air Reduction Co., 120 Broadway, N. Y.



# AUTOMOTIVE CONSTRUCTION

## Caterpillars and Their Construction—I

By K. H. CONDIT
Associate Editor, *American Machinist*

***Everybody is acquainted with the "tank" and knows something about the different members of the "tank" family, but perhaps not so many are acquainted with its immediate ancestors, the "caterpillars," their history and their habits.***

IN VOL. 49 of the *American Machinist* appeared a series of articles on the Holt "caterpillar" tractor as built in the Stockton, Calif., shops. The Western concern is the parent enterprise of the Holt Manufacturing Co., but the Eastern branch, which was located in Peoria, Ill., ten years ago to take care of the up-to-date farmers of the Middle West and also of the export trade, is at present a lusty and thriving offspring.

The old method of building farm machinery in the foundry, which was considered "good enough for the farmer," is heresy to the Holt engineers, and their machine equipment is good evidence of the value which they attach to modern machine tools. The Holt engineers consider their application of machine tools to traction-engine manufacture as the chief factor in their success in building army tractors for the British, French and American governments. Army tests are no joke as men who have been through them can testify and as may be gathered from the photograph in Fig. 1 (a Rock Island Arsenal test). This shows one of the larger models pulling a "caterpillar" trailer through woods and over rather uneven ground. The ability of these queer looking machines to navigate what would ordinarily be called impossible country is almost uncanny. Fig. 2 illustrates another type of bad

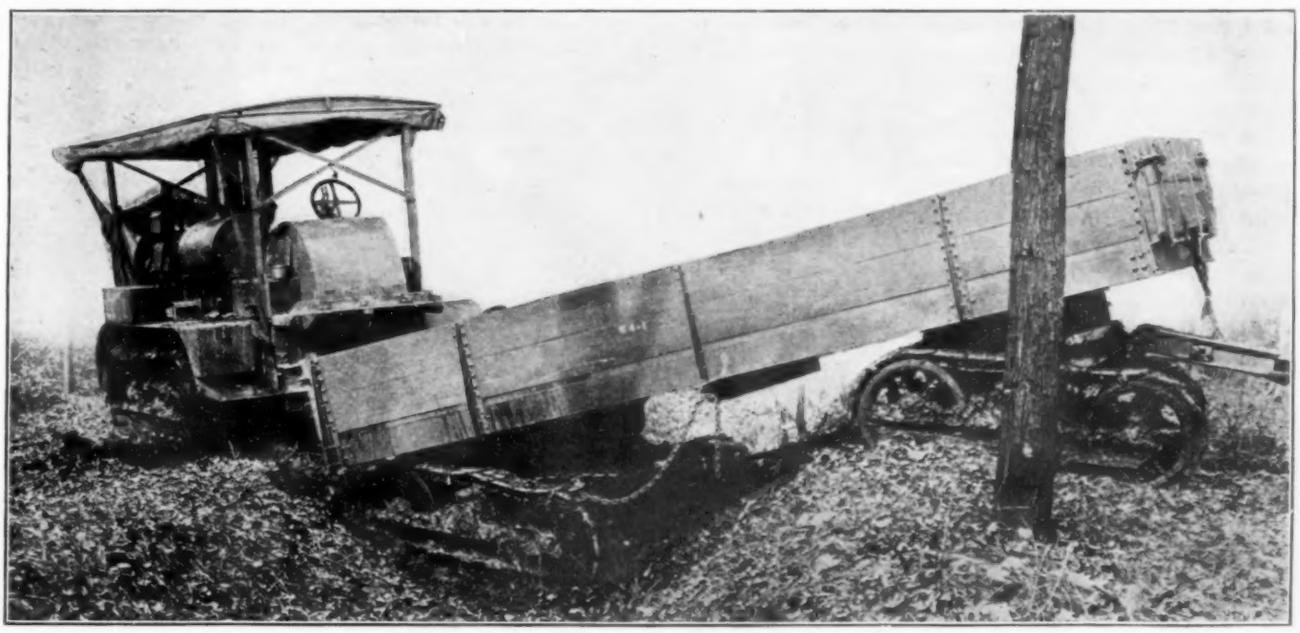


FIG. 1. ARMY TEST OF "CATERPILLAR" TRACTOR AND TRAILER

# AUTOMOTIVE CONSTRUCTION

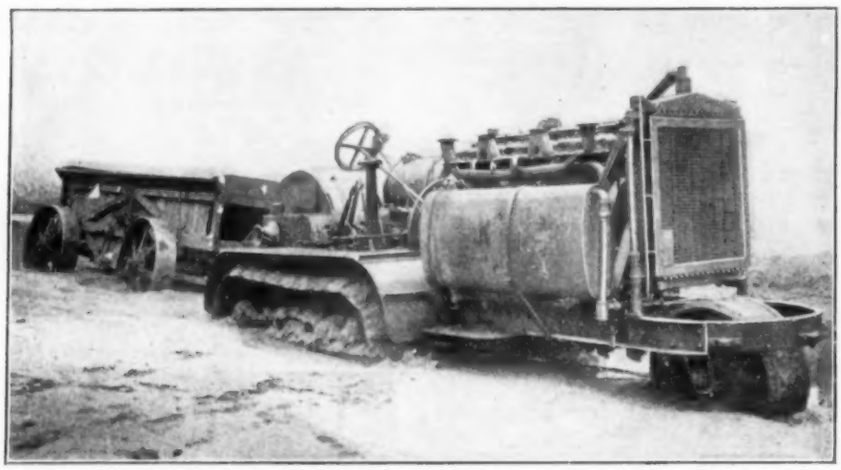


FIG. 2. BIG TRACTOR IN SOFT GOING

country which the "caterpillar" navigates with equanimity. On the British front, some parts of which were notorious for mud and bad going, it was found expedient to keep a "caterpillar" in calling distance of the worst spots to pull out horse-drawn heavy artillery when it got mired and to rescue stalled motor lorries. After several sad experiences where the "caterpillar" pulled the lorry apart in extricating it, orders were issued to treat such cases gently, and better results were obtained. Horses were soon replaced entirely by "caterpillars" for towing the heavy mobile artillery on all fronts.

As early as 1911 these machines were being shipped to all parts of the world, including the great estates of Hungary. Soon after their arrival in the former Dual Empire their performance in soft ground and on steep hillsides attracted the attention of Austrian artillery officers and tests were made to determine the feasibility of using them to drag the huge Skoda howitzers which were being built secretly in large numbers. The tests must have been successful for larger numbers of tractors were at once ordered by the noblemen owning the large estates, and upon the outbreak of the war orders for large quantities of them "for military purposes" were cabled from Vienna. The orders were refused by Holt.

The British war department knew of the success of the Austrian tests and in the fall of 1914 began to investigate the "caterpillar," the Holt company and its facilities. As a result a machine was sent to England in September of that year and passed all the tests that the British artillery and ordnance officers could devise. Orders were immediately placed for all available tractors of the 75- and 120-hp. types and at the end of the fighting, in 1918, thousands of them were in use on all British fronts. Fig. 3 shows the 120-hp., 6-cylinder model. The 75-hp. model is similar except that a 4-cylinder motor is used.

France followed suit but took the smaller 45's for her lighter artillery and called in the old 60's from the big estates in Tunis. The value of these machines to allied armies was tremendous, and the mobility of their heavy artillery reached a stage which the Teutons never approached. It has been stated by a British military critic that had the British had more "caterpillar" tractors they could have saved 1200 guns which were lost in the German advance early in 1918.

So much has been written about the tanks and their work that only their relation to the "caterpillar" will be mentioned here. The development of the machine gun had set British army engineers thinking of some sort of mobile fort or armored land battleship which would offer protection to its crew and to advancing infantry. The great difficulty was to obtain traction in the terribly scarred ground of a modern battlefield. General Swinton of the Royal Engineers, then a colonel, heard of the performances of Holt tractors in Belgium in 1913 or 1914, when a friend who witnessed the demonstration wrote him that "Here was a Yankee farm tractor that could climb like hell." He had long studied the problem and here seemed to be the answer. When the first Holt artillery tractors arrived and he saw them in action he was convinced, and the "tank" was the result. The name was hit upon as a subterfuge to mislead the German secret service and was suggested by the riveted steel shells of the first freakish-looking contrivance. All sorts of wild rumors started as to the purpose for which the tanks were intended, and no attempt was made to stop them for they served to add to the confusion of the Hun. Their first appearance was a startling success and they have been almost invincible ever since, for no really suitable defense against them was ever devised. Under certain conditions it was possible to stop them by catching them in hollows or ravines filled with carbonic-acid gas which would choke the motors, when they could be knocked out by a direct hit from a field gun, but after one or two such experiences it was usually easy to avoid such traps.

The tanks are impervious to rifle and machine-gun fire and from shrapnel bullets and they have one great advantage in attack which is often lost sight of. It is largely psychological but none the less effective. Their size and the consequently easy target which they present tends to draw enemy rifle and machine-gun fire and thus render harmless many bullets which would be

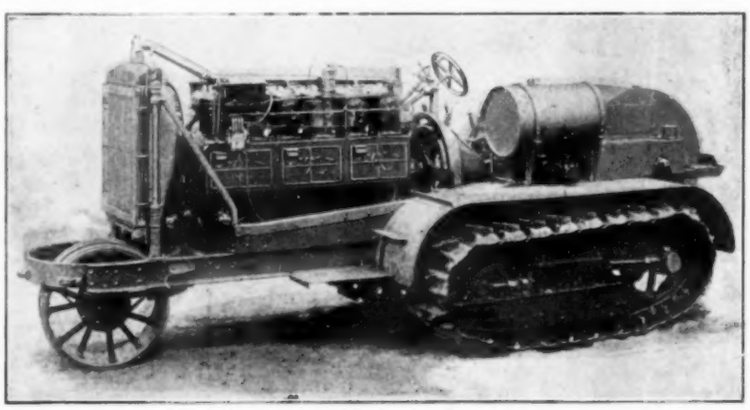


FIG. 3. THE 120-HP. HOLT "CATERPILLAR" TRACTOR

# AUTOMOTIVE CONSTRUCTION

much more dangerous if aimed at the advancing infantry.

The French tanks were somewhat smaller than the British type and were developed from the "caterpillar 45" tractor which the French artillery was using in large numbers. The need for greater speed and activity resulted in the smaller tanks like the British "Whippet" and the French 6-ton, 2-man type, later adopted by our own Ordnance Department.

The functions of the tank and the artillery tractor are quite different, but each has been successful in its own field. Both owe their existence to Benjamin Holt, for the artillery tractor is simply a modified Holt farm-traction engine and the tank owes its inception to the principles underlying the construction of the other. The British war office, under whose direction the tanks were developed, has officially acknowledged its debt to Mr. Holt and has sent two delegations to congratulate Mr. Holt and his associates in person. It should be a source of satisfaction to American machine-tool builders that their tools, handled by American machinists, had a part in the production of one of the few American war implements that was ready when the call sounded.

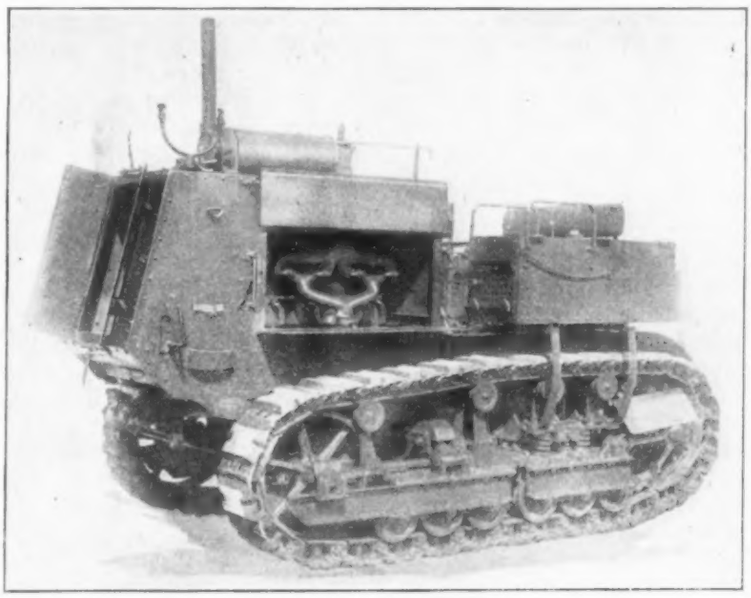


FIG. 4. 10-TON ARTILLERY TRACTOR

Our own army officers were awake to the possibilities of the traction engine for artillery hauling as early as 1910 and were given every assistance by the Holt company in carrying out their plans. Official tests were conducted at the Rock Island Arsenal and at Fort Sill in 1915, and definitely proved the ability of the "caterpillar" tractor. Every effort was made to test the power of the tractor to the limit. A 6-in. gun was deliberately mired until it rested upon the trail and apron but the "caterpillar" soon pulled it out by means of a cable. It unmistakably demonstrated its ability to handle two sections of 6-in. howitzer material in wet gumbo soil. The report of the Army board supervising the test stated with true Army conservatism that it was deemed that the "75" was capable of handling one section of 6-in. howitzer material anywhere under war conditions. This was really a very safe statement as the same type of machine had been doing just that for some months for the British in Flanders. As a result of the Fort Sill tests three 45-hp. tractors were ordered for the 9th Field Artillery and 27 more were added shortly after, completing the motorization of this unit which was then stationed at Honolulu. Trucks were used for hauling ammunition and motorcycles for the officers and dispatch-riders, making this the first completely motorized artillery regiment of any army.

The economy of substituting traction engines for horses in artillery work is brought out by the report of the test appearing in the *Field Artillery Journal* in which it was estimated that complete motorization of a 4.7- or 6-in. battery would save $36,000 in first cost and $30,000 a year in maintenance. In this estimate no account was taken of the saving due to the reduction in personnel made possible, the greatly reduced shipping space or the lessened road length of the outfit when on the march, all important items in field work.

The Quartermaster Corps and the Corps of Engineers had already made exhaustive tests of "caterpillars" for hauling supplies and for making roads in Texas and across the border during the trouble with Mexico. On one test run a big tractor demonstrated its independence of road conditions, when it came to a frail bridge, by unhooking its trailers, descending the bank of a steep ravine, wading a muddy creek and climbing up the opposite bank. The trailers were then pulled across with a cable.

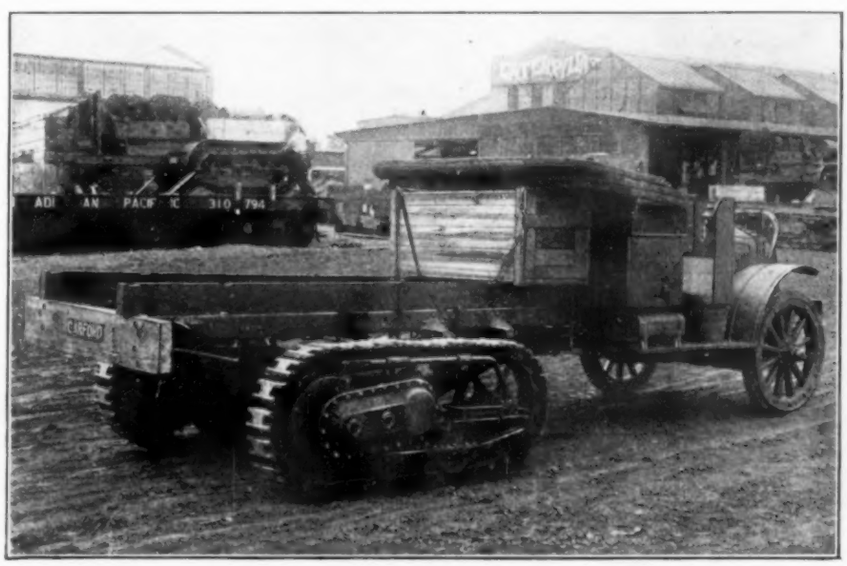


FIG. 5. "CATERPILLAR" ADAPTER ON ARMY TRUCK

## AUTOMOTIVE CONSTRUCTION

These tests convinced the Army authorities, and plans were drawn up for the motorization of our artillery. No funds were available, however, until our entry into the war brought a rude awakening. Then orders to go ahead were given and Army engineers working with those from the Holt company developed the fast 2½-ton, 5-ton and 10-ton artillery tractors from the Holt 12-, 18- and 45-hp. farm tractors. The 10-ton is shown in Fig. 4. This model was built in Peoria at the Holt plant and in Cleveland by the Chandler Motor Co., while the smaller models were distributed among several automobile manufacturers and built under the Holt patent license to the U. S. for military purposes. They were fitted with armor-plate covers for engine, radiator and fuel tank and camouflaged in approved style.

For hauling the heavier guns it was decided to use the 75- and 120-hp. models adopted by the British, as they were in production and giving entire satisfaction. They were designated as the 15-ton and 20-ton artillery tractors.

In addition to artillery tractors and tanks, "caterpillar" trucks were used for heavy trailers, as shown in Fig. 1, for heavy gun mounts, as illustrated in a recent article in the *American Machinist*, and experimentally for self-propelled gun mounts. Production was just starting on the self-propelled type when the armistice was signed. The results anticipated from its use by artillery and ordnance experts would have astounded and demoralized the Huns, as these mounts were so far in advance of anything the enemy had devised. They actually possessed most of the advantages of the railway artillery with the additional feature that they could go anywhere regardless of the terrain.

Fig. 5 shows one more application of the "caterpillar" as used by the Air Service. The "adapter," as it is called, replaces the rear construction of a standard army truck and adds greatly to its ability in bad going. Numbers of these "adapter" trucks were fitted with additional motors and balloon winches for the use of the Balloon Section. In the background of this illustration will be seen a 20-ton model on a flat car being made ready for shipment.

This is a brief history of the work of the Holt "caterpillars" for the Allies. Some of the details of their construction at the Eastern plant will be taken up in later issues.

# The Fixing of Resale Prices—III

By CHESLA C. SHERLOCK

*To what extent does the law sanction restraint of trade? Aside from state and Federal legislation which covers the case in a general way, recent decisions of the bar have admirably touched the more vital points of the question.*

A RECENT Iowa case brings out a novel feature in the resale controversy. It was held that where a seller undertakes by contract to sell an unlimited quantity of goods and extends credit therefor, and the amount of the respective installments to be paid is to be measured by an aliquot part of the sales made during a previous period, the provision for the maintenance of a fixed retail price, the limitation of territory within which goods are to be resold, and the stipulation that buyer shall devote his time and attention exclusively to the sale of such goods may be considered as tending to operate as security for the payment of the purchase price, and, as affording merely reasonable protection to the seller, not to be illegal and void, as being an unreasonable restraint of trade.

In a Federal case decided in 1914, it was held that an agreement entered into by a manufacturer and a wholesaler whereby the wholesaler was not to sell the goods at more than the list price, was not in violation of the Sherman Anti-Trust Act. Certainly, the courts do not adopt the view that a manufacturer has no right to hold down the price of his commodity so that it may reach the consumer at as small a figure as possible.

In another more recent Federal case, where suit was brought against a well-known manufacturer charging violation of the Sherman Act, it was held that a manufacturer selling to jobbers, who were not merely the agents, but the vendees, of the manufacturer, sales not being conditional, but absolute, violated the Federal Anti-Trust Act in exacting from the jobber an agreement to charge the retailer a specified price, and under a penalty of discontinuance of further dealings, and in seeking by a notice printed on its carton to fix the price at which the goods should be resold at retail, notwithstanding that such notice did not constitute a legally effective and enforceable contract between the manufacturer and retailer.

The court said: "The general rule is well settled that a system of contracts between manufacturers, jobbers and retailers by which the manufacturers attempt to control the prices for all sales by all dealers, at wholesale or retail, whether purchasers or subpurchasers, eliminating all competition and fixing the amount which consumers shall pay, amounts to restraint of trade, and is invalid both at common law and so far as it affects interstate commerce under the Sherman Anti-Trust Act."

### Refusing to Sell Legal

In a recent California case, a retail dealer brought an action for damages under the California statute for refusal to sell to the plaintiff at the prices and conditions upon which the defendants sold goods to other retail dealers. It was brought out in this case that the manufacturer was only a small producer of the article which he placed upon the market and that the amount of the product which he produced was only an inconsequential portion of that upon the market. It was held that the manufacturer or wholesaler not only has the right to fix his own price, but also the right to establish the price at which his goods are to be sold at retail, so long as those acts are not the direct effect or result of a combination formed and maintained for himself and others to create restrictions in trade, or to maintain a monopoly of the trade.

In a Texas case decided in 1916, a contract for the purchase of patterns by a retailer, with no reservations of title or restrictions on the sale thereof except a provision fixing the retail price and a provision prohibiting the purchaser from selling other than the goods of his vender, was held to be a plain violation of the Texas Anti-Trust Act.

A Federal case decided in 1915 brought out a unique feature of the law, especially the rules dealing with patented articles. The manufacturer had sought protection for his contractual agreements under the claim that his product was marketed in a patented container, and that because of this fact the usual rules applicable to patented goods should be extended in his favor. But the court had no such charitable view of the matter and held that the fact that the goods were packed in patented containers did not prevent the manufacturer's agreements from being in violation of the Sherman Act, whether the value of the container is negligible as compared with the value of the contents and its purchase a mere incident in the contract of sale, or whether the carton itself has a substantial value, where the sales are not conditional, but absolute, and container was not sold for use with subsequent purchases.

After an examination of a subject of this nature, it is nearly always necessary to rearrange the data "in conclusion" in order that the reader may know to a certainty just what has been accomplished.

Disregarding the statutes and drawing our conclusions entirely from the decisions, we find the following points to be generally true of the resale tangle at the present time. In the first place, it must be kept in mind that we have two separate and distinct series of legislation seeking to prevent an illegal restraint of trade. On the one hand, we have the Federal Act, known as the Sherman Act, which prohibits combinations or agreements between business interests which seek to restrain trade by securing a monopoly. Much has been said and written about this act, but it must be remembered that, like all Federal statutes relating to commerce, it has application only to that portion of the nation's business carried on in interstate commerce. If a business does not engage in interstate commerce it is beyond the reach of the Sherman Act. This exposes a great territory, then, which can be covered only by the legislative action of the respective states, and interpreted by the respective state courts. So while the ultimate purpose of all anti-trust legislation is the same, it, in fact, varies greatly in different jurisdictions. That is why there is an apparent conflict in some of the cases cited—due to difference in statute, and not in a difference of the reasoning powers of the judges.

### Conclusions

Our conclusions, then, are:

1. That restraint of trade is not illegal in itself—unless it amounts to a monopoly.

2. That under state jurisdiction individual agreements fixing resale prices will be permitted so long as they are a reasonable exercise of the right of the seller to protect the business retained by him.

3. That contracts fixing resale prices will be upheld, by the state courts at least, when the covenant is ancillary to the principal agreement.

4. That where the covenant fixing the prices is, in fact, the main purpose of the agreement, and not ancillary, it is void as being in restraint of trade.

5. That the manufacturer of a patented article having a monopoly vested in him by law, has a legal right to fix resale prices and make agreements to that end, which are not deemed in violation of the Sherman Act.

6. That goods produced by means of a secret process are not the subject of control by fixing resale prices any more than goods produced by processes known to all. The manufacturer has a right to protection in his secret process, but this does not extend to the point of granting him a perpetual monopoly by allowing him to fix prices.

7. While a manufacturer can be prevented from making agreements fixing prices in restraint of trade, he cannot be compelled to sell his product to a certain retailer, if he does not desire to do so. One of the inalienable rights of property is the right to sell or refuse to sell, to sell to one person and refuse to sell to another.

8. If a manufacturer refuses to sell to one dealer, he cannot be sued for damages, because he has the right to determine whether he will sell or not. The only way he can be reached in such an instance is by way of breach of contract.

### Competition the Soul of Trade

The purpose of the whole field of the law upon this subject, of course, is to encourage competition. While we may have serious differences of opinion, based upon economic grounds, as to the soundness of competition as a business-builder, the law clings to the belief that competition is the soul of trade. And the object of the decisions is to free competition from the restrictions which men are constantly endeavoring to place upon it in order to profit by its restraint. As long as an agreement does not place itself at cross purposes with the law in this respect, it will not be frowned upon by that jealous mistress.

## Cost of Making a Pair of Offset Centers for a Crankshaft

By Wesly McArdell

On page 300 of *American Machinist*, W. D. Forbes invites criticism of the time taken to make two offset centers for an engine crankshaft. Since a criticism of the time necessarily involves methods, it is quite in order to discuss the methods, the tooling and the machines used. Considering all the machines used and the several unnecessary things that were done, he did well to accomplish it in 13 hours.

Some of the things that strike me as being wrong are as follows: The setscrew holes are first drilled in the ends of the piece and then a 2-in. drill (with a web almost $\frac{1}{4}$ in. thick) is expected to be held central by a No. 40 pilot hole when, about a third of the way down, it strikes this $\frac{9}{16}$-in. tap-drill hole and endures with it for almost a half an inch.

The method of producing the tool-steel centers is a bit unique. A piece of tool steel a couple of feet long gripped in a four-jawed chuck, with enough material projecting to make both centers, would have enabled them to be made all at one setting, insuring absolute concentricity of body and center.

The procedure for these centers would be as follows: Face off bar on end; sink a parting tool into the work down to a diameter of $1\frac{5}{16}$ in. far enough from the

end to have the proper width of shoulder; and then with a round-nosed tool turn the large diameter of the center and also the small diameter where it has a bearing in the machine-steel body. Put in the center and part the piece off, leaving the parting-tool ready to go ahead on the next piece.

Now about the boring mill: the job could have been laid out on the surface plate, the two holes roughed out to 2 in. and $1\frac{5}{16}$ in. respectively on a drilling machine and then the pieces clamped separately in the milling-machine vise, the holes bored and the top surface cleaned up square with the holes all at one setting. The center distance of the holes could be secured just as accurately with the milling-machine screw graduations as with those of the boring mill.

If desirable, the job might have been done as well in the four-jawed chuck of an ordinary lathe. The 1-in. hole would be finished up first and then, using as a button the setting disk that is used to check the 1- to 2-in. micrometers, the position of the second hole could be established quickly and more accurately than either the milling machine or the boring mill could do the job.

The reason for finishing the 1-in. hole first is simply that there is a greater likelihood of finding a 1-in. plug to use in setting our button than there is of finding a $2\frac{1}{16}$-in. plug. After the second hole is bored, the boring bar is replaced with a lathe tool and the front face is cleaned up square with the axis of the holes.

The slotting job is unnecessary. If Mr. Forbes will look at the little piece of brass that is placed between the point of the clamping screw and the spindle on the Brown & Sharpe dividing head, he will see that the slotting had better be left out; indeed, he naïvely admits this when he says "and to allow the shaft to be got out easily if they did," in reference to the setscrews scoring the shaft.

After the two holes have been bored and one side faced off, the other sides can be handled in either the shaping or milling machine. The last machine operation would be the drilling of the setscrew holes in the ends.

I am interested in two points: the doing of as much work as possible at one setting and the use of as few machines as possible. There is today in machine shops too great a tendency toward doing only one thing at a time on a piece in process of manufacture. This is due to the type of machinist we now have to get out work with as much as anything else, I suppose. The other point is making work for a machine; matters being arranged so that a machine that would otherwise be idle is put to work on a job that is dragged in by the ears.

If we are trying to see how much of the shop we can have working on a given job, let that be the objective; but if we are trying to produce or teach, let us use only those machines really needed.

## The Virtue of Accessibility

By Donald A. Hampson

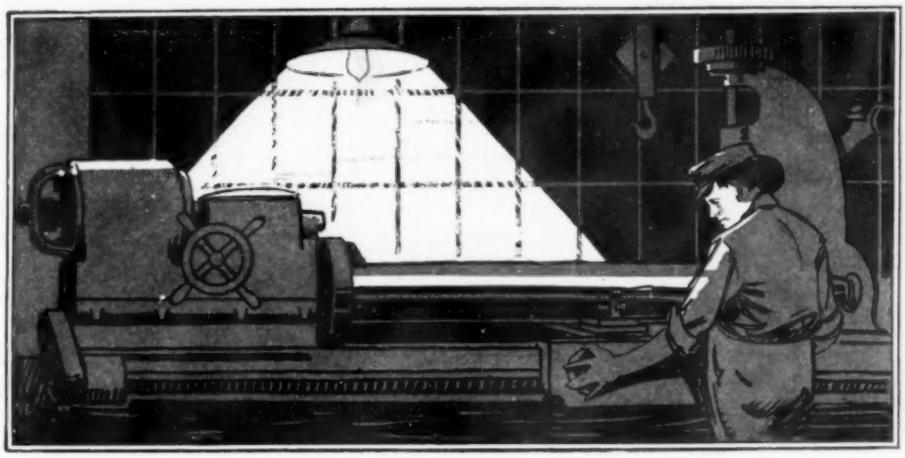
It takes but a minimum of automobile experience to convince men of the machine trades that in a majority of other lines they are working at a great advantage—advantage from the standpoint of accessibility. And when one stops to consider that every automobile includes a power plant and attachments that in stationary practice would occupy five times the space, then the reason for more or less of the inaccessibility becomes apparent.

Not that automobiles are wholly bad in this respect, but it seems—at least, to the man in a hurry—that just the parts that require attention are the ones that necessitate the removal of the most other parts to get at the erring one. "Every time you reach in a tool, something is in the way," as one man aptly expressed it. Because of the necessarily compact design, it takes longer to perform the same operations on an automobile than it would on more rugged machinery where the demands for being "neither seen nor heard" are not so exacting and space is not at a premium. Quite frequently the machinist in other lines is asked to put a proper estimate of time on a piece of work that has been done on a friend's car and for which the friend thinks he has been overcharged. If the machinist is wise and fair he will be exceedingly wary about committing himself, bearing in mind the disadvantage under which the automobile man labors and the time-honored truth that it is an impossibility to estimate the time that has been put on any job by merely looking at the finished product.

The writer's views on relative accessibility of parts received quite a bump from the machine-tool industry not long ago. The instances concerned were on milling machines of first-class make—one an Ohio machine and one an Eastern make. Both had to do with the breaking or shearing pin designed to relieve the feed mechanism of undue stresses. These pins were through the worm that drove the feed screw, and were No. 4 taper. To get them out, the gear box, which was held up against the saddle by screws that were always covered by the table, had to be taken off.

As the table was 5 ft. long and, with the fixture upon it, weighed 700 lb., it was no easy task to remove it to get at the heads of those four exasperatingly hidden screws. Two men had to hustle to take the machine apart, replace the sheared pin, and reassemble in 3 hours' time—and this was just 3 hours too much when the machine was needed every minute. We made excuses for the first two such delays, telling ourselves that they wouldn't happen again, but on the third occasion those No. 4 pins were changed to No. 7's, the same as in the other parts of the train. To retain the safety feature, No. 4 pins were put in the gears on the shafts that drove the feed mechanisms—put where a change could be made in 5 min. if a pin sheared off.

One of the most commendable examples of breaking pieces that I have ever seen forms a part of the drive of some special machines for heavy threading. The parts to be threaded are iron castings just as they come from the sandblast, which means that they have irregularities that would be liable to block or break the machines. The "breaking pieces" used are flat castings, $\frac{3}{8}$ x 2 x 4 in., notched to $\frac{1}{2}$ x 1 in. in the middle; they join a solid driving disk keyed on the shaft with another driven disk loose on the shaft and surrounding the former on the periphery. Slots cast in both disks receive the breaking piece, which transmits the drive, and the thrust of the drive keeps the piece in place. When the machine has a big casting put into it, this piece breaks at the reduced section, when the operator raises a cover at the side of the disks, throws out the broken parts, and puts in a new one. The cover serves as a guard and a retainer for the piece when the machine is standing idle.



**LIGHT, ELECTRICITY and The Shop**

By C. E. Clewell

# Inertia Effects in the Operation of Shop Machinery

*A problem in the operation of machinery is the inertia of moving parts. This article discusses this subject of inertia in the quick acceleration and retardation of machine tools with reference to frequent reversals of planing, shaping and punching machines. Notes are included on reduction of inertia in pulleys by the use of aluminum, and on ways for reducing inertia in a rapidly revolving motor that is subject to frequent reversals.*

IN THE operation of shop machinery, attention to the inertia of parts to be moved is often overlooked. Inertia plays an important part in many shop appliances, sometimes being a disadvantage during the acceleration period and when it becomes necessary to stop the machine frequently and to start it up in the reverse direction. At other times inertia is added to the equipment by utilizing the stored energy of a flywheel at points of the duty cycle where demand for power is made upon the driving motor.

The problem of inertia is closely associated with the electrical features of machine-tool operation, and this article discusses the matter from the standpoint of a mechanical problem and from the standpoint of the electric motor used to drive given machinery and the supply circuits from which power is derived.

## Inertia and Quick Reversal

The operation of a planing machine represents a case of repeated duty cycles, in each of which the platen, pulleys and the work are accelerated quickly and later quickly brought to rest preparatory to acceleration in the reverse direction for the return stroke. In bringing the machine up to its normal cutting speed a certain amount of energy is stored in the moving system represented in a general way by the symbols $1/2Mv^2$, where $M$ is the mass of the system and $v$ its velocity.

Obviously, to bring such a machine up to its full cutting speed involves a large amount of energy during the acceleration period if the mass of the moving parts is large and the velocity attained is high. At the end of the cutting stroke the speed must be brought to zero before reversal can take place, and this means that the energy in the moving system must be dissipated in some way.

If the machine comes to rest by friction only, the stored energy is dissipated in the friction of the various bearing surfaces, but this usually takes too much time, hence mechanical or electric braking is resorted to and the stored energy must be dissipated either by friction of the brake shoes or by electric means. One way to reduce the inertia of a planing machine is to use aluminum pulleys, this tending to reduce the amount of power used in stopping and reversing. The practice of the Cincinnati Planer Co. may be cited in this connection. In practically all sizes of the planing machines manufactured by this concern aluminum reverse pulleys are used, as illustrated in Fig. 1.[1] The lightness of this metal reduces the inertia of the rapidly moving pulleys, and tests by this company show that in the 72-in. motor-driven planing machine, 39 hp. was required at the reversing point with cast-iron pulleys and 30 hp. with aluminum pulleys. Another test showed that with cast-iron pulleys, 165 strokes could be made

FIG. 1. ALUMINUM PULLEYS USED WITH PLANING MACHINE

[1]Figs. 1 and 2 in this article are due to the Cincinnati Planer Co.; Figs. 4 and 6 to the General Electric Co., and Fig. 3 to the Westinghouse Electric and Manufacturing Co.

with a given equipment and that with aluminum pulleys, 189 strokes were possible in the same time interval, indicating a gain of more than 10 per cent., which is a substantial gain to production. In Fig. 2 an arrangement of the pulleys on one planing machine is shown. In ordinary planing-machine operation it is the general practice to use a constant-speed motor and to depend on the pulley arrangement only for reversal of the platen. In such cases the motor operates continuously in one direction and its inertia does not enter into the reversal as a factor in the amount of stored energy to dissipate. In the reversing motor equipment the motor reverses each time the platen is reversed, and its inertia then becomes a factor since the stored energy in the motor armature is large at the high speeds at which the motor is operated.

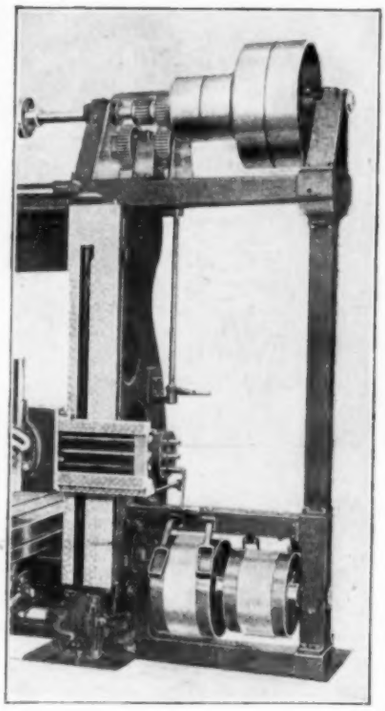


FIG. 2. PULLEY ARRANGEMENT OF MOTOR-DRIVEN PLANING MACHINE

The flywheel effect of a motor armature may be very great because of its high speed, and published figures show that the inertia of a motor armature operating at 1000 r.p.m. may be many times greater than that of a planing-machine platen operating at its highest linear velocity. This has resulted in the designing of reversing motors with smaller armature diameters, although such a course has a number of limitations from electrical and mechanical standpoints.

The inertia of the very large motors such, for instance, as the one of 6000-hp. capacity shown in Fig. 3, may be very high. Again, the inertia of an elevator and its motor is another illustration. Here, the kinetic energy (termed inertia effect above) of a motor armature required to operate a 3000-lb. elevator amounted to less than 10 per cent. of the total inertia of the elevator system in mind, this being due to the low speed of the motor armature. In such a case there is no great advantage in a motor with an especially small armature[2].

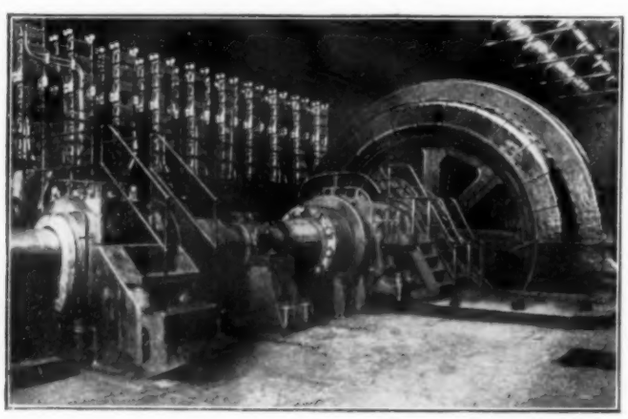


FIG. 3. A 6000-HP. MOTOR OPERATING A RAIL MILL

The shop crane presents a number of problems in raising, lowering and transporting loads. In hoisting, energy is imparted to the system in lifting a certain number of pounds a given distance, and in lowering the load, the accumulated energy due to the lift must be dissipated in the form of heat.

H. F. Stratton states that in handling a 5000-lb. lifting magnet a distance of 20 ft. twice per minute for a period of 30 min., the heat generated in a mechanical brake by the crane in lowering such a magnet, if concentrated into melting effect, is sufficient to melt from 15 to 20 lb. of cast iron, and in lowering 50 tons a distance of 300 ft. with mechanical braking the heat would be sufficient to melt 100 lb. of iron.

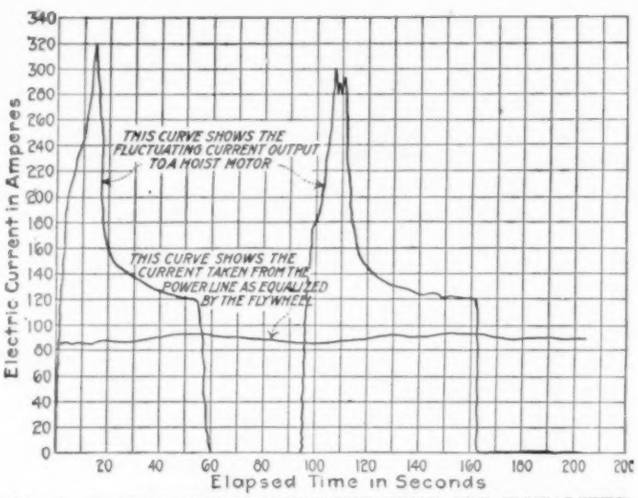

Electric Current in Amperes
Elapsed Time in Seconds
THIS CURVE SHOWS THE FLUCTUATING CURRENT OUTPUT TO A HOIST MOTOR
THIS CURVE SHOWS THE CURRENT TAKEN FROM THE POWER LINE AS EQUALIZED BY THE FLYWHEEL

FIG. 4. TEST CURVES OF FLUCTUATING AND EQUALIZED CURRENTS IN THE OPERATION OF A HOIST

The maintenance charges on mechanical brakes has been demonstrated to be very large, one figure being over $700 a year on a 5-ton crane and another over $1400 for the same period. The substitution of electric brakes in these two cases reduced the maintenance charges to a negligible amount, according to a paper by H. F. Stratton in the *Iron Trade Review*, Jan. 2, 1919.

The inertia of the parts of the crane itself in the transportation of material must be taken into account in the motor equipment as regards the energy required for acceleration and retardation.

The stored energy in a heavy flywheel may be used to meet the requirements of heavy peaks of load which occur periodically in the operation of certain machinery, but which last only for a few seconds at a time. The energy which a flywheel is able to give up depends on the difference of the squares of the initial and final speeds of the flywheel in the interval during which it gives up its energy, the process being limited to a very short interval. This is illustrated by the fact that while

[2]See Trans. Am. Inst. of Elec. Eng., discussion of Albert Brunt, Vol. XXXIV, p. 209. A good, brief discussion of flywheel effects is found in the "Handbook for Electrical Engineers," p. 547, to which reference has been made in several instances in the preparation of these notes.

a given flywheel might be able to handle a 100 per cent. overload for a second or so it might be unable to handle an overload of half that for several seconds. The number of horsepower-seconds which can be utilized from the flywheel in such cases is determined by the following symbols:

$\frac{W(V_1^2 - V_2^2)}{2g \times 550}$ where $W$ is the weight of the flywheel in pounds, $V_1$ is the maximum velocity of the flywheel at its radius of gyration in feet per second and $V_2$ is the minimum velocity of the flywheel at its radius of gyration in feet per second, $g$ being the factor of acceleration due to gravity or 32.2 ft. per second.

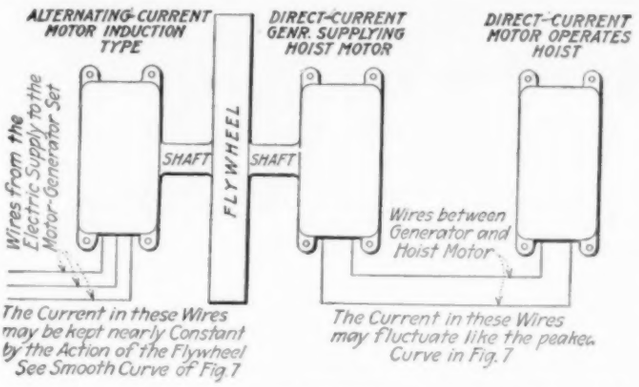

ALTERNATING-CURRENT MOTOR INDUCTION TYPE
DIRECT-CURRENT GENR. SUPPLYING HOIST MOTOR
DIRECT-CURRENT MOTOR OPERATES HOIST
Wires from the Electric Supply to the Motor-Generator Set
SHAFT
FLYWHEEL
SHAFT
Wires between Generator and Hoist Motor
The Current in these Wires may be kept nearly Constant by the Action of the Flywheel See Smooth Curve of Fig. 7
The Current in these Wires may fluctuate like the peaked Curve in Fig. 7

FIG. 5. DIAGRAM OF A FLYWHEEL MOTOR-GENERATOR SET FOR EQUALIZING THE CURRENT REQUIREMENTS FOR HOISTING

It will be observed that if a suitable arrangement of control is provided on a motor-driven equipment with a flywheel, the rate at which the flywheel can be made to impart its energy to the system during short periods of overload can be so fixed as to keep the load on the driving motor down to some average amount, provided the flywheel is large enough to fulfill the overload-peak requirements. (See "Standard Handbook for Electrical Engineers," fourth edition, page 1250.)

The principles here outlined can be made to apply to shop machinery such as punching machines, air compressors and rolling mills, and indirectly to hoisting machinery.

A difficulty in the operation of machinery which goes through successive duty cycles with excessive peaks of power is the disturbance caused in the electrical-power system. A scheme whereby the power taken from the supply circuits can be reduced to some average load will form an important point in operating the electric-supply system as a whole. The curve with the very high peaks in Fig. 4 illustrates the use to which the flywheel may be put for reducing them.

Fig. 5 illustrates a widely used equipment for the purpose just mentioned. This set consists of a motor, at the extreme left, which is mechanically coupled by a shaft to the generator that supplies the current to the driving motor. Between the generator and the motor a large flywheel is placed on the connecting shaft. The power-supply circuits furnish current to the motor of the set, and thus indirectly supply the power for the motor at the extreme right which operates the hoist.

The action is as follows: In operating the hoist the driving motor supplies the demand for power made by the hoist. When the demand is relatively small, as when the hoist is being lowered, the driving motor to the left is able to accelerate the flywheel up to its maximum speed. However, when the hoist load becomes excessive, as indicated by the peaks in Fig. 4, the induction motor of Fig. 5 automatically slows down by a certain amount, and during this brief interval the flywheel is able to give to the generator of the set enough of its stored energy to handle the peak-load requirement. In this manner the load taken from the power-supply lines to the left is kept down to an almost perfectly smooth curve, as shown in the lower part of Fig. 4.

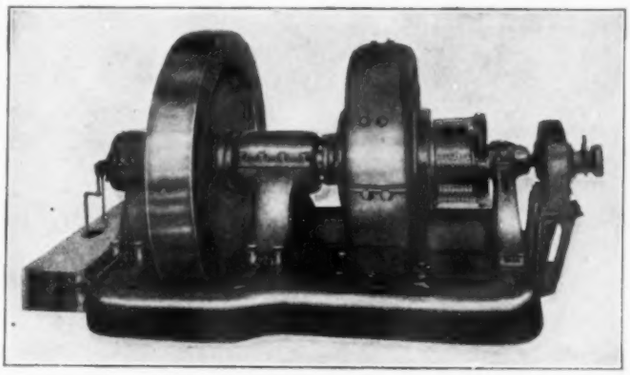


FIG. 6. FLYWHEEL MOTOR BALANCER

### The Flywheel Motor Balancer

The unit, Fig. 6, is termed a flywheel motor balancer, and consists of a motor and a flywheel on the same shaft, with an exciter for supplying field excitation to the motor. This device may be used to equalize the load on a constant-voltage direct- or alternating-current electric system. When used on the direct-current system the motor is connected across the mains on the switchboard of the power house, and by varying the speed of the unit may be made automatically to return power to the system as a whole at periods of heavy overload on the power house by so exciting the motor as to convert it temporarily into a generator. This allows the flywheel to give up its stored energy to the electric-supply circuit through the motor during its short action as a generator. When the load on the power house falls off again, the motor automatically takes power from the supply mains and, acting as a motor, it speeds up the flywheel to its normal full speed preparatory to a succeeding interval when the power house may again be subjected to a heavy overload. In this way the actual output of the main generators in the power house may be kept down to a predetermined average amount.

## A Machine for Grinding Button Dies

SPECIAL CORRESPONDENCE

Sharpening button dies by hand grinding has always been so uncertain in its results that many manufacturers have deemed it economical to scrap such dies as soon as they become dull.

The Locomobile Co. of America, Bridgeport, Conn., being astonished at the number of button dies that were scrapped in their plant, determined to develop a machine for salvaging them by regrinding the cutting edges, and the first machine they built has been in successful use for over a year and has more than paid for itself.

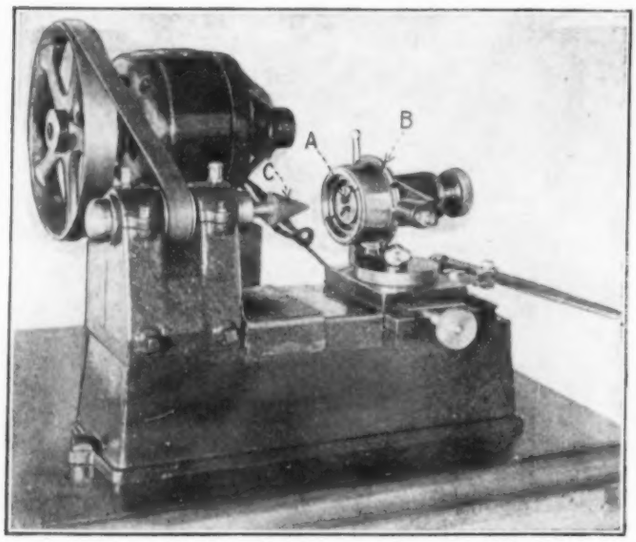



FIG. 1. THE DIE-GRINDING MACHINE

A manufacturer learning of this machine asked to have one built for him, and in considering the matter it occurred to the management of the Locomobile Co. that it would be a good plan to build some of these machines for the market as fillers in and to have them built by the apprentice boys in their shop.

Accordingly, the machine was re-designed and the drawings turned over to the apprentice boys. The patterns were made by apprentices in the pattern shop and the machine was built by apprentices in the toolroom.

The first machine has been completed and is illustrated in Figs. 1 and 2. In Fig. 1 the machine is shown ready for use and a die to be sharpened may be seen at *A* in the draw-in collet. The collet is provided with three steps to accommodate dies of 1½ in., 2 in. and 2½ in. in diameter and can be indexed by the notched plate *B* for grinding dies with three, four or six cutting edges.

The carriage is movable in both longitudinal and transverse direction, and suitable stops are provided to limit its travel. In addition to this the swivel head carrying the collet can be swung to any required angle both horizontally and vertically. Grinding is accomplished by the conical wheel *C* which runs at 10,000 r.p.m. As will be seen from the illustration, the machine is

FIG. 2. THE SWIVEL HEAD

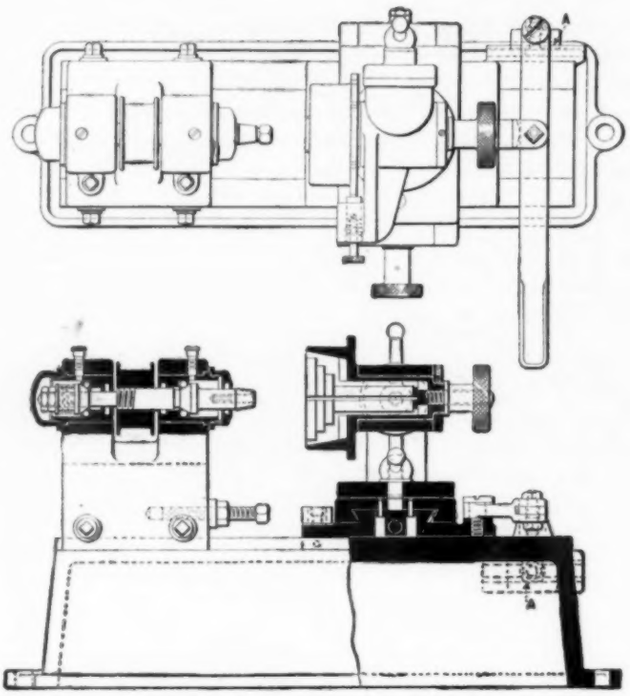


FIG. 3. ASSEMBLY DRAWING OF THE DIE GRINDING

driven by belt from a motor mounted on the brick at the rear. The spindle runs in ball bearings of the cone and cup type which are kept tight endwise by a piano-wire spiral spring.

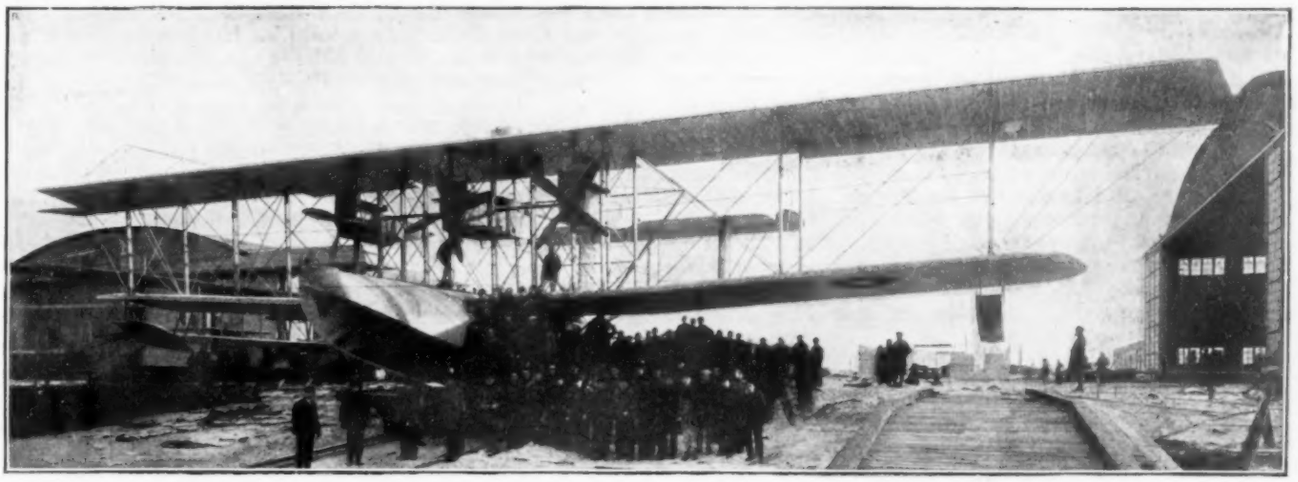
Fig. 2 shows the angular adjustments provided for the swivelling head.

Fig. 3 is an assembly drawing of the machine and is self-explanatory. Attention may, however, be called to the adjustment provided for the location of the fulcrum of the operating lever at *A*, so that in any position occupied by the carrage this fulcrum can be so located as to bring the operating end of the lever into a convenient position.

In showing the machine to prospective customers or upon its installation in the purchaser's shop, it is the intention of the Locomobile Co. to have it demonstrated by the boys who built it. The machine is well and substantially built and reflects great credit on the apprentices who were responsible for its construction.

Fig. 4 is a group of the boys who built this machine and I think our readers will agree that they are a very intelligent looking bunch.

FIG. 4. APPRENTICES WHO BUILT THE DIE GRINDING MACHINE



# Progress in Naval Aircraft—II*

By COMMANDER J. C. HUNSAKER
Bureau of Construction and Repair, Navy Department, Washington, D. C.

***In this concluding installment the work of the Bureau of Steam Engineering is described and also the exhaustive tests made on the NC boats to prove the accuracy of the theoretical calculations. The article concludes with the navigation curves and data supplied to the transatlantic pilots and a table showing the characteristics of the final NC flying boat.***

THE plant of the Curtiss Engineering Corporation at Garden City, N. Y., was of insufficient size for the building of flying boats of the dimensions of the NC-1. It was, accordingly, necessary for the Navy Department to authorize the erection, at its own expense, of a building attached to this plant of sufficient size for the complete assembly of two of the flying boats at one time. In addition, the ordinary facilities of the Curtiss company were such that it was certain that the attempt of that organization to carry out in complete detail the entire construction of these flying boats would be productive of most serious delays in completion. It was decided to build them on the assembly basis; that is to say, the various elements would be built by different plants turning out a product of a somewhat similar nature, or one requiring workmen of similar qualifications to those ordinarily employed for work of the nature of that in contemplation. These different elements would then be shipped to Garden City to be assembled there into the completed flying boats. As a result of this decision, different parts were built at the following places:

Boat hulls—Curtiss Engineering Corporation, Garden City, N. Y.; Lawley & Sons Boat Co., Boston, Mass.; Herreshoff Co., Bristol, R. I.

Tail booms—Pigeon-Fraser Hollow Spar Co., Boston, Mass.

Gasoline tanks—Aluminum Co. of America., Pittsburgh, Penn.

Wings, control surfaces and struts—Locke Body Co., New York City.

Nacelles, major details, gasoline system and all wiring—Curtiss Engineering Corporation, Garden City, N. Y.

Metal Fittings—Unger Bros., Newark, N. J.; Beaver Machine Co., Newark, N. J.; Brewster Body Co., New York City.

Wing-tip floats—Albany Boat Co., Albany, N. Y.; Naval Aircraft Factory, Philadelphia, Penn.

Liberty engines—Packard Motor Car Co., Detroit, Mich.; Ford Motor Car Co., Detroit, Mich.

There were also not available at any operating station hangars of sufficient size for housing these flying boats. Construction was arranged for by the Navy Department at the Rockaway Beach Naval Air Station of a building of sufficient size for housing two of these boats. Due to their very large size, special handling arrangements of the marine railway type for getting them into and out of the water were necessary and were provided. Rockaway Beach was chosen for the location of the hangar and handling arrangements on account of its nearness to the Curtiss Engineering Corporation plant and of its excellent location for carrying out the flying tests which would be necessary.

The use of a marine railway for getting the boats in and out of the water is new for aircraft and has been found to permit the handling of these large and heavy boats with fewer men and with less risks of damage and loss of time than the conventional handling truck on rollers that is man-handled down an inclined concrete runway leading into the water. The boat in its hangar rests on cradles fitting the bottom and provided with four caster wheels. On this truck the boat is pulled out of the hangar to the marine railway by an ordinary agricultural tractor. The entire load including the truck is then shoved on the car of the marine railway and secured to it. The marine railway car has flanged wheels running on rails extending out into deep water. It is lowered away until the boat is waterborne and floats off the car. The marine railway car is then submerged with the handling truck and cradle secured to it ready to receive the boat on its return. Simple and positive means are provided for centering the boat when it is again floated in place over the cradles, and when it is secured in place the tractor runs it out. The whole operation takes only a handful of men and a few minutes time.

The first of these flying boats was completed and flown Oct. 4, 1918, or approximately 1 yr. from the commencement of the design. The trials were a source of great satisfaction as it was soon demonstrated that the control and balance in the air were very satisfactory and in accordance with the prediction of the wind-tunnel tests, and that the performance on the water was all that could be desired and entirely justified the confidence placed in the model tests in the towing basin. No structural weakness

*Paper presented at the Semi-Annual Meeting, June 23-27, 1919, of the Society of Automotive Engineers.

developed and the speed came out as predicted. In short, this flying boat designed from theoretical and model experimental data, combined with the practical experience of a half dozen or more people, performed in every way so close to its designed characteristics as to justify completely the methods of the naval architect as here applied in the design of a flying machine.

As flying tests on the first boat were continued, many changes were tried to improve the original design and, as these were found advantageous, were incorporated on this and on the other three boats building. The Bureau of Steam Engineering, at this stage, was able to improve the performance of the boat materially by the application of new propellers designed in that bureau. The NC-1 was originally fitted with standard Navy low-compression Liberty engines, which were found to be entirely satisfactory, but during the period that the NC-1 was being tested with these engines the Bureau of Steam Engineering, in its experimental laboratory at the Washington Navy Yard, perfected carbureter adjustments on the high-compression Liberty engines which materially improved its economy. Since the high-compression engine gave greater power than the low-compression type, these engines replaced the original installation on the NC-1. With the new propellers and engines, the boat got out of the water and flew easily with a total weight of 24,700 lb. The designed load was 22,000 lb. Besides providing propellers and engines for the boat, the Bureau of Steam Engineering supplied a remarkably efficient electric self-starter to each engine. This type of self-starter, the Bijur, weighed only 35 lb., and by this improvement it was possible for the pilot to start any engine without leaving his seat. It is believed that this constitutes the first application of an electric self-starter to the Liberty engine.

The month of November, 1918, was spent in thoroughly trying out the NC-1. Among other flights a round trip from Rockaway, N. Y., to Washington, via the entrance to the Chesapeake Bay was made with nine people on board. On Nov. 25 the NC-1 broke the world's record for passenger carrying, having on board in the air 51 persons. One of these was a stowaway, who had concealed himself in the interior of the hull for over 1 hr. prior to the start of the flight and is probably the first man deliberately to stow himself away on an airplane to make a voyage. On these flights Naval Constructor Richardson was in charge and was one of the pilots.

After making various minor improvements, it was concluded that the maximum which could be obtained from three Liberty engines had been reached and no further improvements in performance could be expected until geared Liberty engines became available. These were still in an experimental stage. It was apparent, however, that the flying part of the craft could sustain a greater load if more power were available, and it was accordingly decided to add a fourth engine making a total of four Liberty engines. The second boat completed designated as NC-2 was, therefore, fitted with four Liberty engines arranged as two pairs of tandems and on its trials in March, 1919, successfully flew with a total weight of 28,000 lb. The addition of the fourth engine, which increased the dead weight of the boat by about 1500 lb., permitted about 3300 lb. of extra weight to be carried, or a net gain of 1800 lb.

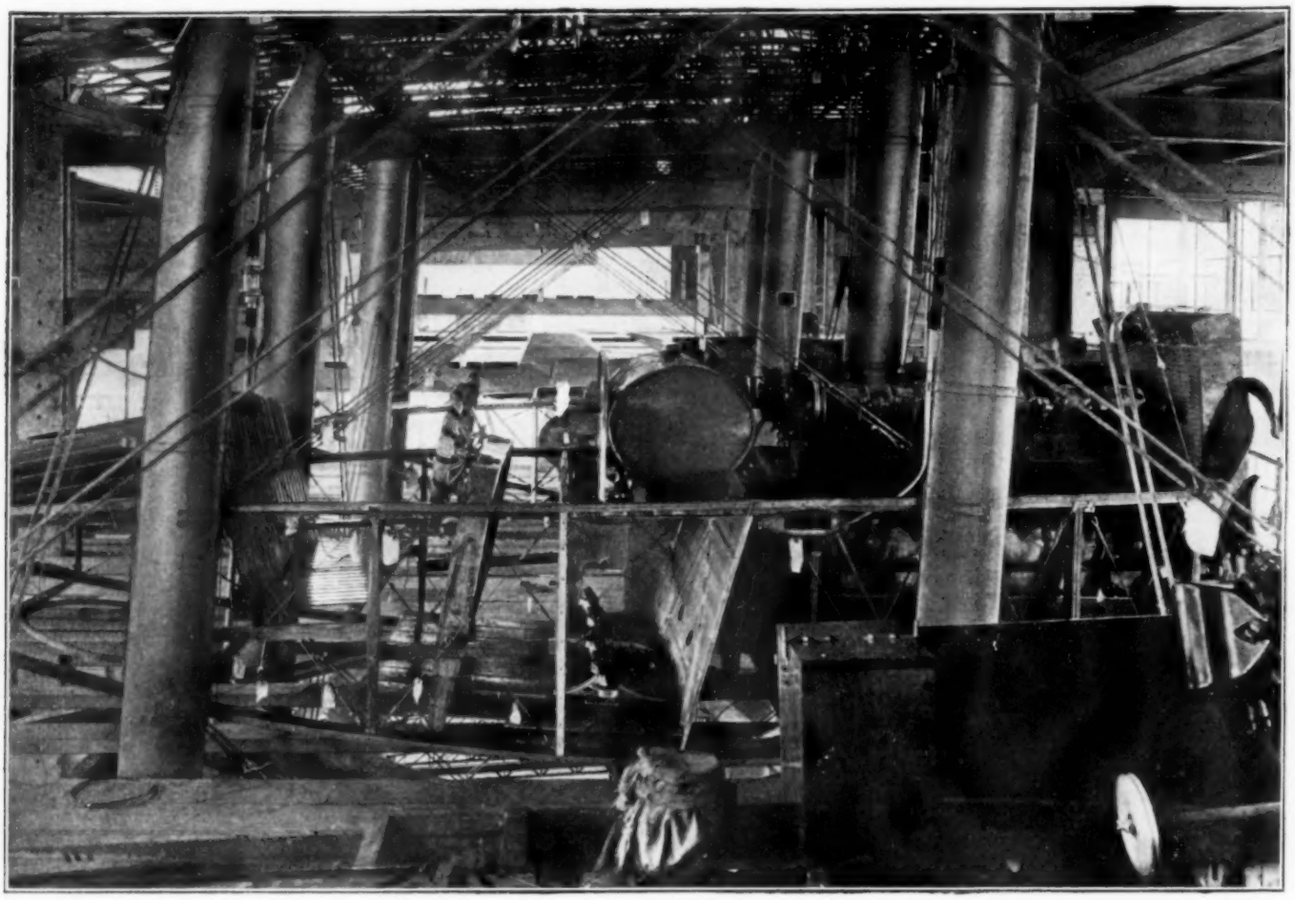


FIG. 6. PILOT'S SEAT IN THE ORIGINAL NC-1

The NC-3 and NC-4 were completed in April, 1919, and were likewise fitted with four high-compression Liberty engines but with a somewhat different arrangement. In these two boats two engines were arranged on the center line as a tandem pair and with the other two engines mounted on the wings as tractors, as were the wing engines on the NC-1. In these boats a further change was made by omitting the center nacelle, shown in Fig. 6, and placing the pilots in a cockpit in the hull, as shown in Fig. 7. This arrangement of engines is novel and has the ad-

vantage of concentrating weights near the center of the boat so that it can be maneuvered more easily in the air.

Due to injury to two outer wing sections while at anchor in a gale late in March, the NC-1 was temporarily put out of commission. After the completion of weight-lifting trials on the NC-2, the outer wing sections of that boat were transferred to the NC-1 as no spare wings were available. Except for this regrettable injury, all four of these boats would have been able to leave Rockaway Beach together for the transatlantic flight.

### Special Equipment for Transatlantic Flight

The equipment of the boats for the transatlantic flight differs somewhat from the installation designed for anti-submarine patrol work. Bombs and bomb racks, bomb sights and release gear were omitted. The machine gun and gunner's position in an egg on the top plane were taken off as well as the gun installation in the bow and stern of the hull. The radio consisted of apparatus for sending both in the air and on the water besides the radio telephone and direction-finding outfit.

The power-plant equipment consisted of the usual thermometers, pressure gages, tachometers, gasoline gages, etc., and for four engines amounted to a very complicated installation to be brought into the boat. Each engine has independent throttle controls and self-starter all brought together at the pilot's seat so that he has complete control of any and all engines at all times.

The equipment for navigating consisted of a bubble sextant, compass and a drift calculator which was improvised from the ground speed bar of Colonel Crocco's ground speed indicator as used on Italian airships. This instrument was made up by the Naval Gun Factory from data supplied by Colonel Crocco. Special slide rules and tables were prepared to shorten navigational calculations.

With boats as large as the NC's, the pilots no longer control the machine by the feel of it but must be provided with instruments to indicate at any instant just what the altitude is. The inertia is so great that the pilot cannot wait until a disturbance from normal flying condition becomes pronounced. What he wants is advance information so that he can check a tendency before it develops.

The most important instrument is the air-speed indicator, as he must know whether he has flying speed and also whether he is flying at economical speed. During the war, various types of air-speed meters were tried. Most consisted of the usual pitot tube connected with a sensitive pressure gage. For ordinary speeds, especially the low speeds when leaving the water or landing, the pitot tube gives a very low pressure to be measured. Consequently, an exceedingly delicate pressure gage is needed. Our experience with such gages was not very satisfactory. No reliable and useful speed indicator was available until the Zahm type of venturi nozzle was developed in the bureau. This merely replaces the pitot tube by a venturi tube. The latter for a given air speed gives several times the pressure of a pitot tube and requires only a cheap and rugged pressure gage. It had been found that flying through rain and spray water gets into leads and makes the speed readings false. In Dr. Zahm's instrument provision is made to keep it sprayproof.

Besides his air speed the pilot wishes to know the inclination or trim of the hull. For this a lateral and longitudinal inclinometer is provided. These are of the usual type, consisting of a bent glass tube filled with colored liquid. The only improvement added by us was the use of flourescene in the liquid and the addition of a small electric light inside the instrument in such a manner as to be invisible to the pilot yet to cause the liquid to glow with a pale green light. For night flying the pilot should not have a bright light in his eyes.

To give warning of the start of a turn, the compass is not sufficiently sensitive and several forms of turn indicator have been used. A British type which is useful consists of two pitot tubes, one mounted on each wing tip, connected differentially with a pressure gage which registers the difference between the pressures generated by the two pitots. The NC's for the transatlantic flight were equipped with a Sperry gryoscope which tumbles at the start of a turn and gives early warning.

The boat has interior telephones for communication as well as speaking tubes. The latter are rather difficult to use when all four engines are going on account of the noise, but a special sound-proof helmet was designed which effectively cuts out external noises. The feature of this helmet is the use of a pad of sponge rubber to deaden external noises surrounding a metallic ear trumpet to magnify the sounds transmitted through the speaking tube. It has been found practicable to converse through a ¼-in. internal-diameter tube with the engines running.

Other equipment consists of sea-anchor, emergency rations and thermos flasks, special clothing, fire extinguishers, running lights, signal lamp and interior lighting arrangements.

A hand-operated pump is provided to drain the bilges of water and a careful arrangement of ventilators flushes out any gasoline fumes which may accumulate in the hull.

A small supply of spare parts and tools for emergency repairs in flight is carried and proved its usefulness on the NC-4 en route from Halifax to Trepassey Bay. Her engineer, Moore, noted that the gravity tank was leaking gasoline around some rivet heads after the flight had been under way some time. This tank is located in the upper wing, immediately over the central pair of engines. He left his position in the stern of the boat, crawled along the top side and under the guard of the rear propeller and climbed up on top of the center engines and while going through the air at 80 miles per hour stopped the tank leaks. To permit such a passage, a sheet-aluminum tunnel had been installed on top of the boat under the after propeller which prevents a man's clothes being drawn into the blades.

### Calculations of Performance

In designing the NC, it was at once clear that the cost would necessarily be very high for the first units not only on account of their unprecedented size but because of the great amount of experimental work necessary. Naturally, if the boats were a failure in performance the funds spent could hardly be justified. Very careful calculations of the relations between speed, power, resistance and endurance were made. I am very happy to say the performance actually realized on trials checked the calculations very closely. In fact, the precision of the measurements of speed, power and fuel consumption on the trials was such that we do not know whether the calculated or the measured values are nearer the truth.

TABLE I. DISTRIBUTION OF DRAG

| | Per Cent. |
|---|---|
| Hull, cockpits and appendages | 4 |
| Wing-tip floats | 3 |
| Power plants and radiators and installation | 20 |
| Tail booms and braces | 1 |
| Wing struts | 3 |
| Rudder and fin | 1 |
| All wiring | 12 |
| Stabilizer and elevators | 3 |
| Total parasite | 47 |
| Wings | 53 |
| Total drag | 100 |

The performance was calculated from a determination of the total drag of the machine at various angles of incidence and speeds, corresponding to different gross loads. In arriving at values of the drag for the various speeds, the angle of incidence of the wings was the determining factor. This angle of incidence was determined by the different gross loads which would obtain as the weight dropped off as fuel was consumed.

From these drag calculations the curves of Fig. 8 were drawn of horsepower required plotted against velocity. The curves for various gross loads of the machine are given. Since for the transatlantic flight it was intended to fly these machines at their economical velocities to obtain the maximum possible cruising range, special propellers to give maximum efficiency over this speed range

were constructed. The curve of propeller efficiency is reproduced in which allowance for the reduction in efficiency of the center pusher operating in the slip-stream of the center tractor has been made.

The percentages in Table I give the distribution of this drag at a 5-deg. angle of incidence of wings and a velocity of 70 knots.

The economical cruising velocities in still air are those velocities which correspond to the maximum ratio of the gross load to the total drag of the machine, assuming that the propellers will give their maximum efficiency and the engines will be so operated as to give their minimum fuel consumption per brake horsepower delivered at the velocities corresponding to this angle as the gross load decreases due to fuel consumed.

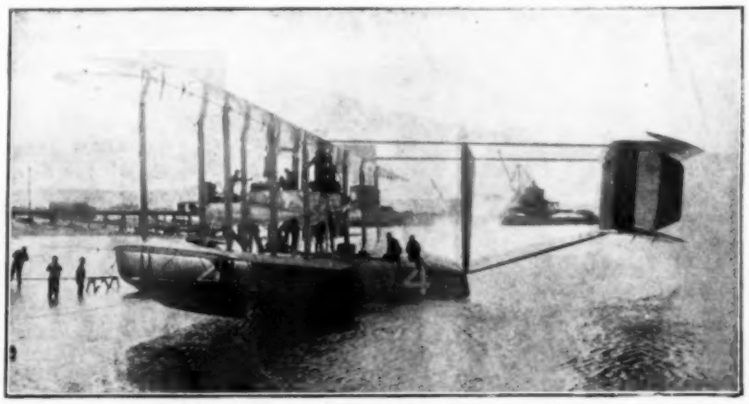


FIG. 7. SIDE VIEW OF NC-4 SHOWING OUTRIGGER, TAIL AND TUNNEL UNDER PROPELLER

The brake horsepower used in computing the cruising range curves, Fig. 9, was determined by dividing the horsepower required at the economical velocities for the various gross loads by the propeller efficiencies at these velocities, Fig. 10. The area under the curve between an abscissa which represents the gross load less gasoline and the gross load abscissa gives the maximum cruising range in nautical miles in still air. The cruising range is limited by the maximum load which can be sustained in the air. Assuming that the fuel consumption of the engines in flight will vary as the consumption on the block test in the laboratory, when the maximum gross load at which the machine will get into the air in sustained flight is determined for three and for four engines, the maximum cruising range can be determined for either installation. The area under the three-engine curve between the 16,340 and 17,670 lb. ordinates represents the increase in range due the weight saved on the fourth engine installation and the weight of oil to be consumed by it, provided three engines could get the same load into the air as four engines do. The block test curves show that below a gross load of 23,500 lb., the maximum range for three engines is increased in addition by the area added due to the steeper slope of the three-engine curve. However, a larger gross load can be lifted into the air with four engines than with three and the added reliability of the machine due to the fourth engine must be taken into consideration. The block test data appeared rather optimistic and showed a very low average consumption. It was decided, therefore, to put a blanket factor upon all average block tests and use a straight fuel consumption in flight of 0.5 lb. per b.hp. per hour for both three- and four-engine installations.

### Propeller Efficiency Neglected

This neglects the loss in propeller efficiency of the tandem pusher in the four-engine installation, which was within the precision of the blanket fuel consumption figure assumed and the probable error due to the failure of an engine. The worst failure that might occur would be that of the center tractor, since then the center pusher propeller due to the absence of the slip-stream of the tractor propeller would be running in an air stream of a greatly decreased velocity from that for which it was designed. The failure of either outboard tractor would give a yawing moment due to the unbalanced thrust and the drag would also be added to it by the drag component of the rudders held over to keep the machine on its course in addition to the drag of the dead propeller. The "ideal" failure would be, if a failure must occur, the center pusher engine since it would not affect the steering qualities of the machine. As a matter of fact, the corkscrew rotation of a pusher slip-stream not being straightened by any body behind it, causes, in yawing to one side, the middle rudder to ride at a relative angle of incidence and gives a yawing force on the machine. This yawing force must be counteracted by a steady force on the rudder bar. In addition, as a driving unit, the pusher engine due to a lower propeller efficiency is the one that can best be spared. Using a blanket fuel consumption narrows the problem to that of being able, leaving out of consideration the damage which might be caused by the tips of the propellers failing while cutting through green water or to the hull or wings in taking off, to get into the air using four engines with a gross load which will give under the 0.5 lb. per b.hp. per hour curve a greater area between this maximum load and that which can be lifted by three engines than that area under the curve as represented by the ordinates 16,340 and the 17,660 lb. corresponding to the weights of the two different power-plant arrangements.

The following figures based on 0.5 lb. per b.hp. per hour show a comparison of the maximum cruising range with four engines and with three: Engines, 4; maximum initial load, 28,000 lb.; range, 1420 nautical miles. Engines, 3; maximum initial load, 25,000 lb.; range, 1320 nautical miles.

Accordingly, tests were made at Rockaway to determine whether three or four engines should be used in the transatlantic flight. The NC-3, although four engines were installed, was loaded to 26,000 lb. The center tractor propeller was taken off and a proper pusher propeller put on the pusher engine. The machine failed to get off. However, with the four-engine installation operating, loaded to 28,000 lb., it got off. With this heavy wing loading, 11.8 per square foot, the machine was handled satisfactorily in the air; therefore, aside from the added reliability, the four-engine installation showed the better cruising range and was adopted. The points spotted in on the 28,000-lb. horsepower required curve reproduced represent actual test data from runs made Apr. 12 and 14 at Rockaway on the NC-2 with the four-engine, two-wing tandem installation.

### Curves Supplied to Pilots

Curves, Fig. 11, were supplied to the pilots to show at what velocities the machine should be flown to obtain the maximum cruising range under operating conditions. As the load goes off due to fuel consumed, the economical velocity of the machine must change to keep the machine at its maximum load-drag ratio which is a constant for a given machine. The angle of incidence of the wings is 8 deg. for the NC. This velocity and consequently the corresponding angle is not the same for operating conditions when there is a wind component along the course as it is in still air. These curves which are reproduced show fuel consumption plotted against velocity, the six curves covering flying loads of from 28,000 down to 16,000 lb. To obtain the economical velocities:

(1) *Still air*—From zero velocity draw a tangent to the load curve at which the machine is flying. The point of tangency gives on the horizontal velocity scale the economical velocity of the machine.

(2) *Tail wind*—From the velocity of the tail wind as read on the horizontal scale to the left of zero a tangent to the load curve will give the economical velocity, flying with that particular tail wind.

(3) *Head wind*—From the velocity of the head wind as

read on the horizontal scale, to the right of zero, in the same direction as the velocities of the machine a tangent to the load curve will give the economical velocity with that particular head wind.

In the transatlantic flight the component of the surface wind along the path was communicated to the machines by the destroyers stationed along the path. This surface wind would give a good indication of what might be expected at the height at which the machines were flying.

Actual test data on the machines gave results which, within the limits of experimental error in reducing these results to the propeller efficiency condition required, were a check upon the calculated data. Therefore, the accuracy of the curves for their purpose in predicting the performance of the machines was verified.

The weights used in calculating the maximum cruising range of the machines for four and for three engines are given in Table II.

TABLE II. WEIGHTS FOR CALCULATING CRUISING RANGE

Four Engines, 17,660 Lb.

| Detailed | Lb. |
|---|---|
| Light condition | 14,700 |
| Crew, including flying equipment | 1,000 |
| Radio, telephone and telegraph set, installation and accessories | 300 |
| Water in radiators | 340 |
| Oil | 1,000 |
| Outfit and equipment | 316 |
| Total | 17,656 |

Three Engines, 16,340 Lb.

| Detailed | Lb. |
|---|---|
| Subtract from four-engine condition: | |
| Engine, bare | 820 |
| Water in engine | 45 |
| Water in radiator | 50 |
| Radiator | 105 |
| Propeller | 60 |
| Electric starter | 35 |
| Oil | 200 |
| Total | 1,315 |

Allowance was not made for the saving in weight due to tank weights, since the tanks were in units of 200 gal. each and whether one or two tanks could come out would depend of course on the amount of fuel that the three-engine boat could take off with.

### Specification Data

The NC flying boat weighs when fully loaded 28,000 lb., and when empty but including radiator water and fixed

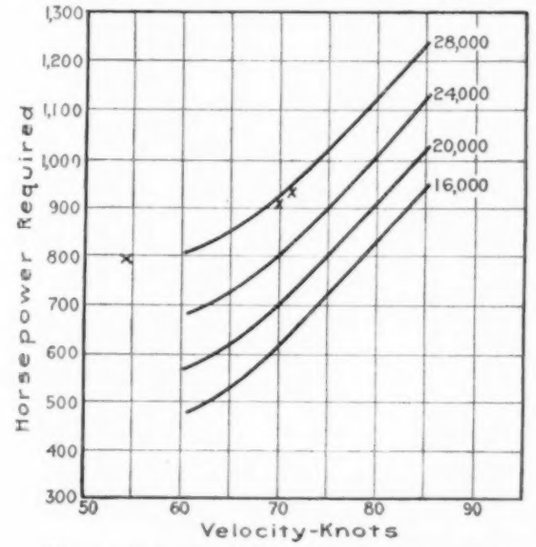



FIG. 8. HORSEPOWER-VELOCITY CURVES

instruments and equipment 15,874 lb. The useful load available for crew, supplies and fuel is, therefore, 12,126 lb., or over 43 per cent. This useful load may be put into fuel, explosives, freight, etc., in any proportion desired. For an endurance flight there would be a crew of five men, 850 lb.; radio and radio telephone, 220 lb.; food and water, signal lights, spare parts, and miscellaneous equipment, 524 lb.; oil, 750 lb., and gasoline 9650 lb. This should suffice for a flight of 1400 sea miles. The radio outfit is of sufficient power to communicate with ships 200 miles away.

TABLE III. WEIGHT STATEMENT OF NC'S

Weight Distribution

| | Lb. | Percentage | |
|---|---|---|---|
| Tail surfaces and outriggers | 1,019 | 6 | 3.6 |
| Wings, struts, wires, fairings | 4,042 | 25 | 14.4 |
| All tanks, pipes and fittings | 892 | 6 | 3.2 |
| Four powerplants complete | 4,799 | 30 | 17.2 |
| Installation and foundations | 742 | 5 | 2.7 |
| Hull, wing floats, fixed equipment, controls, etc. (bare hull 2,800 lb.) | 3,740 | 24 | 13.4 |
| Water in radiators and engines | 640 | 4 | 2.3 |
| Weight empty | 15,874 | 100 | |
| Useful load | 12,126 | | 43.2 |
| Gross weight | 28,000 | | 100.0 |

Unit Weights

| | Lb. per Sq.Ft. |
|---|---|
| Wings, including ailerons completely covered, with all fittings | 1.19 |
| Wing struts and interplane wires | 0.49 |
| Elevators, complete ready for installation | 0.88 |
| Horizontal stabilizer, complete | 0.96 |
| Rudders and fins, complete | 0.91 |
| Tail group, braced together as a biplane but not including outrigger booms to hold it in place | 0.95 |
| | **Lb. per Lb. Displacement** |
| Bare hull, normal displacement, 22,000 lb. | 0.12 |
| Bare hull, abnormal displacement, 28,000 lb. | 0.10 |
| | **Lb. per Gal.** |
| 200-gal. aluminum gasoline tank, complete with fittings and gage | 0.35 |
| 91-gal. terne plate gravity tank | 0.90 |
| | **Lb. per B.Hp.** |
| Radiators, empty, range between types used | 0.30 to 0.38 |
| Propeller and hub | 0.24 |
| Water for engines, including water for engine radiators and piping | 0.40 |
| Total powerplant, exclusive of foundations and structural bracing | 4.00 |
| Foundations and structural bracing | 0.46 |

The radio telephone would be used to talk to other planes in the formation or within 25 miles.

Weight statements are always of interest to aëronautical engineers and I give in Table III an analysis made up from the detail weights.

The principal dimensions and characteristics of the NC type may be summarized as in Table IV.

As I stated above, the NC design represents organized engineering. It is impossible to give credit correctly to

TABLE IV. CHARACTERISTICS OF NC BOATS

| | |
|---|---|
| Type engines | Liberty |
| Number of engines | 4 |
| Power, hp. | 1,600 |
| Span, upper, ft. | 126 |
| Span, lower, ft. | 94 |
| Length, ft. in. | 68—5½ |
| Height, ft. in. | 24—5½ |
| Chord, ft. | 12 |
| Gap, ft. | 13½ to 12 |
| Wing curve | R.A.F. 6 |
| Angle of wings to hull, deg. | 3 |
| Angle of engines to hull, deg. | 0 |
| Angle of stabilizer to hull, deg. | 2 |
| Upper dihedral angle, deg. | 0 |
| Lower dihedral angle, deg. | 3 |
| Wing area, including ailerons, sq.ft. | 2,380 |
| Aileron area, sq.ft. | 265 |
| Stabilizer area, sq.ft. | 268 |
| Rudder area, sq.ft. | 69 |
| Elevator area, sq.ft. | 240 |
| Fin area, sq.ft. | 79 |
| Weight empty, lb. | 15,874 |
| Weight loaded, lb. | 28,000 |
| Useful load, lb. | 12,126 |
| Capacity of gravity tank, gal. | 91 |
| Capacity of fuel tanks, gal. | 1,800 |
| Capacity of oil tanks, gal. | 160 |
| Maximum speed at 28,000 lb., knots. | 74 |
| Minimum speed at 28,000 lb., knots. | 58 |
| Maximum speed at 24,000 lb., knots. | 84 |
| Minimum speed at 24,000 lb., knots. | 55 |
| Center of gravity | 35 to 45 per cent. of wing chord |
| Factor of safety for 28,000 lb. | 3 |

many engineers who did good work on her, especially to the men in the bureau and in the Curtiss organization who did the work as regular routine duty. With many engineers doing good jobs is so normal a day's work that it is only when a failure is recorded that their names appear. It should be of interest to record, however, the

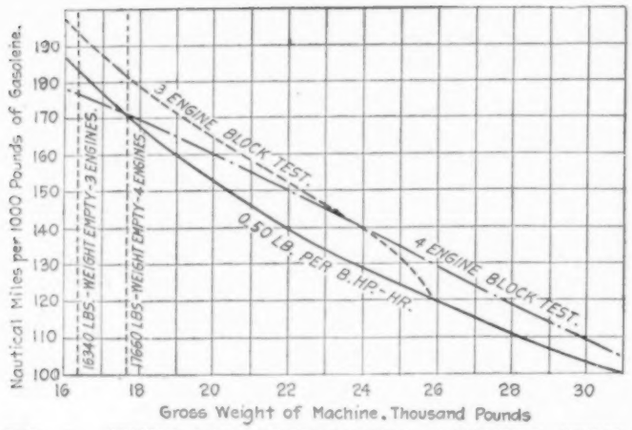

Nautical Miles per 1000 Pounds of Gasolene
Gross Weight of Machine, Thousand Pounds
3 ENGINE BLOCK TEST
4 ENGINE BLOCK TEST
0.50 LB. PER B.HP.-HR.
16340 LBS.-WEIGHT EMPTY-3 ENGINES
17660 LBS.-WEIGHT EMPTY-4 ENGINES

FIG. 9. CURVE FOR DETERMINING MAXIMUM CRUISING RANGE

responsibility of certain individuals for important features. For example: Glenn H. Curtiss suggested the outrigger type of tail and Starr Truscott and Prof. Luther of the bureau developed the theory of the difficult and indeterminate structure required so that it could

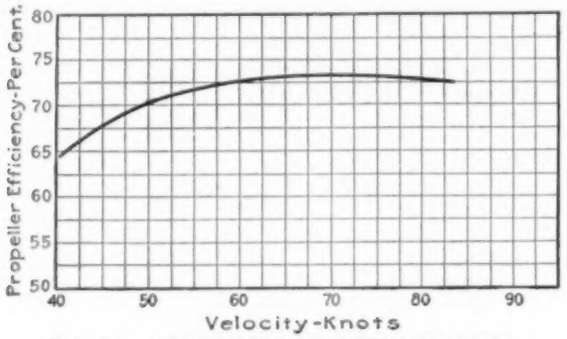



FIG. 10. PROPELLER EFFICIENCY CURVE

be designed with confidence. Naval Constructor H. C. Richardson designed the hull of the boat with the assistance of Naval Constructor McEntee, who conducted the towing tank experiments, and W. L. Gilmore of the Curtiss company, who got out the structural details. The design and construction of the wing girder was handled by Naval Constructor G. C. Westervelt, who had as his assistant for matters of structural design and safety, Ensign C. J. McCarthy, formerly of the instructing staff of the Massachusetts Institute of Technology. Dr. A. F. Zahm made the wind-tunnel investigations, and Lieut. C. B. Harper of the bureau made the performance calculations. The connection of Messrs. Gilmore and Christen of the Curtiss company with the design touched all points and cannot be summed up in few words. In the actual building of the boats, Naval Constructor Westervelt took charge and arranged for parts contracts as given above. Naturally, all of these firms contributed their knowledge and experience.

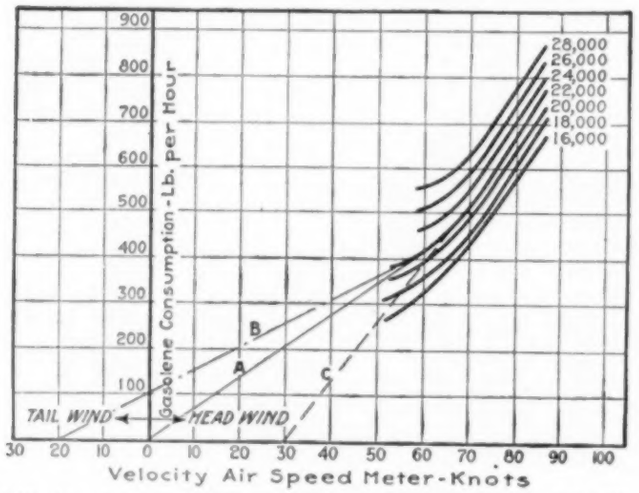



FIG. 11. NAVIGATION CURVES SUPPLIED TO NC PILOTS

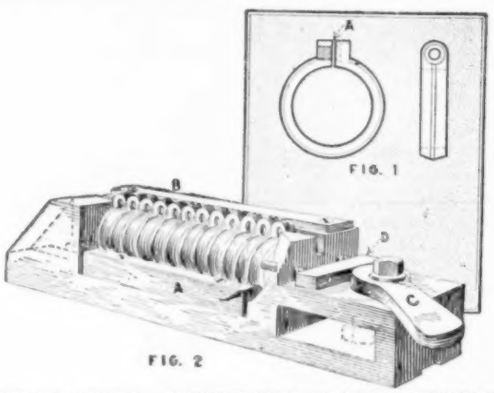
In short, the NC design is an all-American proposition like the Liberty engine. It represents the organized result of what we had learned from previous experience, what we could deduce as to the future by application of aëronautical engineering theory and methods and what we could learn from foreign practice.

## A Simple Slitting Fixture

BY GEO. H. THOMAS

A unique and fast-loading fixture for slitting the tube clamp, as at *A*, Fig. 1, is shown in Fig. 2.

The base of the fixture is provided with a V-block *A* for supporting the bodies of the clamps, while the ears




FIGS. 1 AND 2. A TUBE CLAMP AND A SIMPLE SLITTING FIXTURE

are aligned by the straight-edge *B*. The string of clamps is securely held by the cam lever *C* acting on equalizer bar *D*. It is important, in designing this fixture, that ample clearance be provided between the parts of the fixture and the slitting saw and to provide a capacity consistent with economical loading time.

## Fastening Abrasive Disks Without Glue

BY B. H. GOLDSBOROUGH

I recently discovered an interesting and effective method of holding abrasive disks of cloth or paper for use on disk-grinding machines or for similar purposes.

Instead of using glue as is customary and being obliged to wait several hours until it is thoroughly dry, I discovered, quite by accident, a much better and simpler method.

Simply take a stick of any standard belt dressing and apply it to the revolving disk until it is completely covered. Then stop the disk and press the disk of cloth or paper firmly into place with the hand or by using a board if you prefer.

It is then ready for immediate use, for no drying is required as in the case of glue, and it also has other advantages. The disks can be put smoothly in place much more easily than with glue and there is no difficulty with wrinkles which sometimes tear the whole disk. The other advantage is that, in order to remove the abrasive disk, it is only necessary to peel up one edge and pull the whole disk off at one stroke. It is equally easy to put a new disk in place and continue work.

US ARMY ORDNANCE NEWS

# The British 18-Pounder Quick-Firing Gun

By I. WILLIAM CHUBB
European Editor, *American Machinist*

*The methods of manufacture described in this article are employed in one of the several national factories specially organized by Great Britain, the basis of the factory in the present instance being an engineering works which had been closed for commercial reasons, and was empty. At first the place was arranged as a national shell factory, but in due course a large proportion was devoted to the production of the 18-pdr. field gun, though part of the plant remained for use in shell production.*

THE particular 18-pdr. gun with which the following matter is concerned has a bore 3.3 in. in diameter, the length to the face of the breech screw being 92.62 in., and the total length of the gun being 96.96 in. The gun (see Fig. 1) is built up of carbon steel, the jacket being shrunk on the A-tube which projects slightly at the muzzle end. Over the chamber portion, the A-tube is wound with steel wire. On each side of the jacket are projecting webs or wings which act as guides when in the cradle of the gun carriage. The breech ring is screwed and shrunk on the end of the jacket and secured by setscrews. On top is a plane for the clinometer and projecting is a lug by which the hydraulic buffer is attached.

In the factory under notice possibly a larger proportion of work than usual is undertaken by women. Much of the gagging, rough-turning and boring of the A-tube is done by women, who also attend to the rifling machinery. All setting up is done by skilled men, there being about one skilled man to every three women. Both standard turning and planing tools have clearances of about 6 deg. and top rakes of 5 to 6 deg. With the exception of the rough-turning and planing all operations are wet, Lardoline being

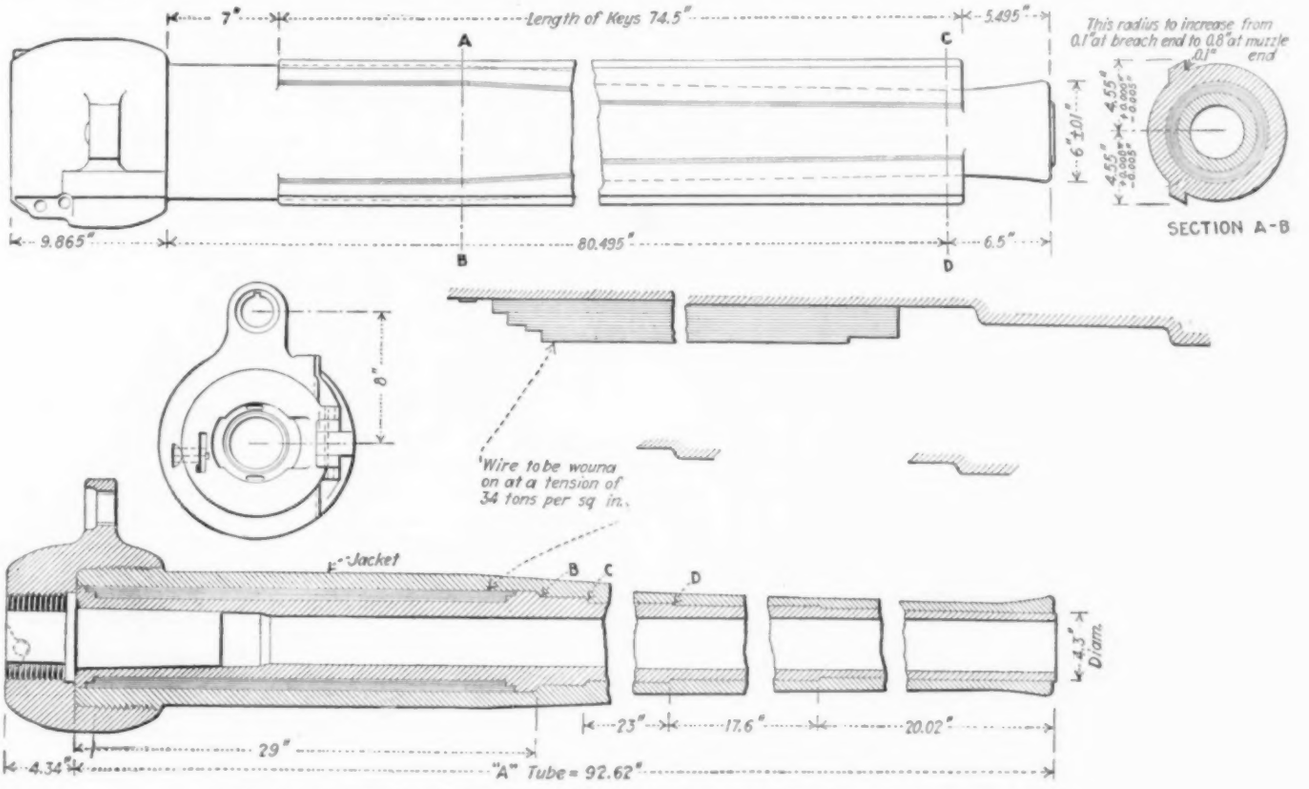



FIG. 1. ELEVATION AND SECTION OF GUN WITH DETAILS OF CONSTRUCTION

# ARMY ORDNANCE NEWS

employed and supplied by piping from a central system at a pressure of 60 lb. per sq.in. For rifling lard oil is used.

The A-tube is generally received forged, rough-turned, bored and heat-treated, the bore being $2\frac{3}{4}$ in., while the outside diameters are about $\frac{1}{2}$ in. over size, Fig. 2 illustrating the tube as it is received. Up to a point indicated later the work is of a standard character, now largely undertaken by women. Fig. 3 shows one of the departments devoted to rough-turning, the machines at the left being for second boring and with part of a wire-winding machine in the foreground.

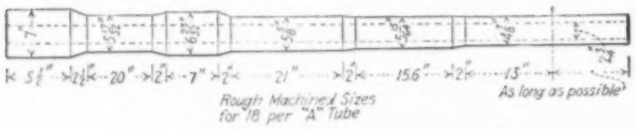



FIG. 2. ROUGH-MACHINED A-TUBE

The second turning is an ordinary lathe operation, the tube being supported on expanding centers at each end and driven by clamps from the faceplate. The usual speed is about 38 r.p.m., that is, about 60 ft. per min. on the maximum diameter and the feed is $2\frac{5}{16}$ in. per min. The tube is turned to the diameters and lengths given on Fig. 4.

For the second boring the work is held at the breech end in a bell chuck, the other end being run in an ordinary steadyrest with three brass pads. In front is a bracket bored and positioned to the center of the lathe. This is used for setting the end of the A-tube and as an extension of the tube hole to support the boring head. A bushing in the steadyrest receives a boring head which is of D-bit form (Fig. 5) with hardened steel pads. The boring bar *A* is of hydraulic tubing and carries a head *B*. The pads *C* are of hardened tool steel, and the boring tool is set up by screw *D*, being secured by screw *E*. The hole is bored in one cut to 3.2 in., leaving 0.1 in., and the usual speed is 20 r.p.m. with a feed of $\frac{1}{4}$ in. per min. The bore is gaged every 6 in. by girls using rockover verniers, the zero position being taken where the A-tube will be finally cut off at the breech end.

In turning for the wire it is usual to turn a set of three sizes, namely, plan, 0.025 in. and 0.055 in. above plan, so that eventually, when wire-wound, there will be a selection of A-tubes to suit the ready-bored jackets. These three sizes will give a considerable range when the tubes are wire-wound, owing to the permitted variations of 0.002 in. in the actual wire sizes, that is 0.001 in. either way. Grooves *S* and *Y* in Fig. 6 are turned at the ends for securing the wires. The sizes from *C* to *G* are for producing a selection of A-tubes for larger jackets from repair guns. The turning is a wet operation and sets of solid caliper gages are provided. The speed is 18 r.p.m. and the feed 1 in. per minute.

For winding the wire the tube is run at a speed of about 40 r.p.m. and about 720 to 750 yd. of wire are wound on, the section of the wire being 0.04 in. by 0.25 in. As a preliminary the wire is wound into coils, each drum containing enough for three A-tubes. A scarf joint, riveted across, is used for the different lengths and no jointing is done on the winding machine, the winding drum being arranged to prevent joints coming in places where they are not wanted on the gun. The finish end of the wire is at the breech end of the gun and both here and at the starting end it is let into grooves

FIG. 3. TURNING THE A-TUBE

previously turned to the width of the wire, a channel at a correct inclination being cut across by a chisel. The end of the wire is then inserted in the groove and the metal is riveted over by hammer. In winding the chief point is to keep the tension correct and to take care of the packing or fitting-in rings which lift the wire from one layer to another to avoid lumpiness at the ends. The wire must be level and any irregularities are removed by filing or hand-turning on each layer, except the last two layers, which must not be touched.

The machine employed is of the type in which the wire is drawn through dies controlled by toggles. A diagram of the system is given in Fig. 7. The wire passes through the two blocks *F*, the bottom block being on a slide and pulled backward by the bellcrank lever shown with weight *W*. The top block is pressed down by the toggle and the pressure exerted by the handwheel and screw *W'*. The center point of the toggle is fixed. Should the friction between the blocks and the wire be greater than the pull exerted by the weight *W*, the wire would pull the blocks toward the right, relieving the toggle until the friction resistance became equal to the

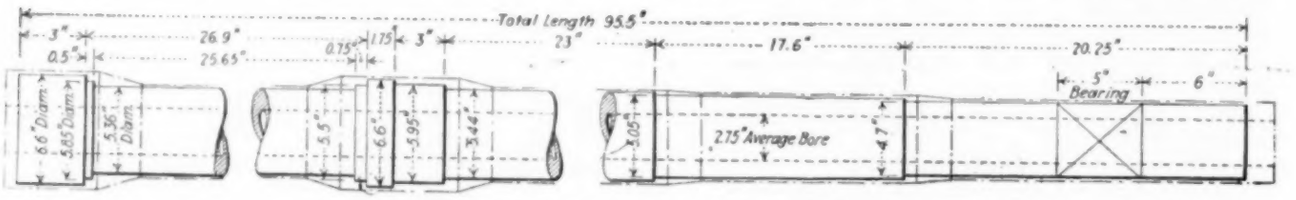



FIG. 4. A-TUBE AFTER THE SECOND TURNING

# ARMY ORDNANCE NEWS

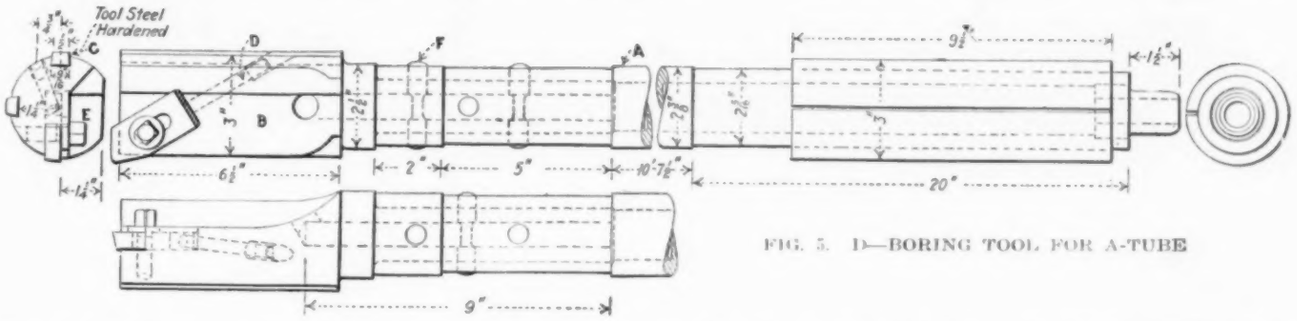
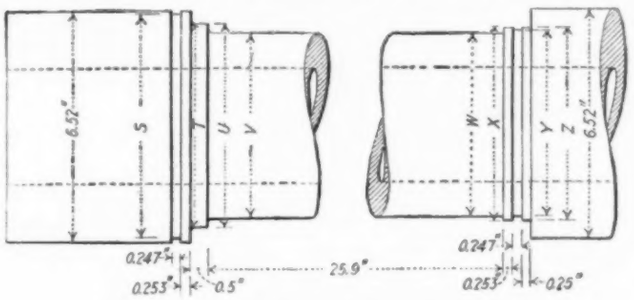



FIG. 5. D—BORING TOOL FOR A-TUBE

pull of the weight. If, however, the pressure at $W'$ does not cause sufficient friction, the weight $W$ will pull the blocks toward the left, thereby straightening the toggle lever and giving an increased pressure between the dies. Thus the tension in the wire can be adjusted by varying the weight $W$. The amount by which the toggle lever is out of the vertical introduces, of course, a small variation. The bearing strips are renewable and wear is adjusted for by the handwheel above the toggle levers. Generally a scale is fixed alongside the center point of the toggles so that the levers can be kept in a constant position, that is, the dimension $A$ can be kept constant, and thus the relation between the weight on the lever and the tension on the wire is kept unchanged. To keep the friction blocks cool, water having soap or soluble oil mixed with it is used.

At the side of the machine illustrated in Fig. 8 is a pulley and weight system by which the tension is checked. The wire is taken from the carriage over a




| Sizes Above Plan Mk. II | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| LETTER | PLAN SIZES | A 0.025" | B 0.055" | C 0.085" | D 0.115" | E 0.145" | F 0.175" | G 0.205" |
| S | 6.149 | 6.174 | 6.204 | 6.234 | 6.264 | 6.294 | 6.324 | 6.354 |
| T | 5.547 | 5.572 | 5.602 | 5.632 | 5.662 | 5.692 | 5.722 | 5.752 |
| U | 5.545 | 5.570 | 5.600 | 5.630 | 5.660 | 5.690 | 5.720 | 5.750 |
| V | 5.065 | 5.090 | 5.120 | 5.150 | 5.180 | 5.210 | 5.240 | 5.270 |
| W | 4.962 | 4.987 | 5.017 | 5.047 | 5.077 | 5.107 | 5.137 | 5.167 |
| X | 5.202 | 5.227 | 5.257 | 5.287 | 5.317 | 5.347 | 5.377 | 5.407 |
| Y | 5.120 | 5.145 | 5.175 | 5.205 | 5.235 | 5.265 | 5.295 | 5.325 |
| Z | 5.199 | 5.224 | 5.254 | 5.284 | 5.314 | 5.344 | 5.374 | 5.404 |

FIG. 6. SIZES FOR TURNING A-TUBE FOR WIRING

pulley and then down to a second pulley before passing upward to a third pulley and then to the gun. The lower pulley is carried on a lever, having a weight at one end and the fulcrum at the other. The position of the lever in the stop shows whether the tension in the two wires that support the weight is correct, the weight being calculated to float at that condition. In the winding the motion should be arranged so that the bending of the wire is in one direction only throughout the process.

The bore is gaged with micrometers to determine the collapse due to wiring which is usually about 0.003 in. to 0.005 in. on the diameter. The gaging positions are 0.6 in., 6 in., 12 in., 18 in., 24 in., and 27½ in. from the breech end. The sizes over the wire obtained are rated in steps of about 0.02 in. and the tubes would be classified as those under 6.24 in. over the wire, those between 6.24 in. and 6.26 in., the next division including tubes from 6.26 in. to 6.28 in. in diameter, and so on,

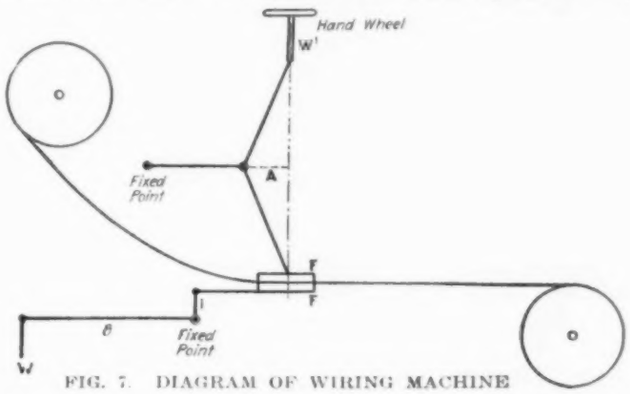



FIG. 7. DIAGRAM OF WIRING MACHINE

the larger sizes including repair tubes. The sizes are known as A, B, C, D and so on.

The next operation is to select a tube to suit a given jacket. The jacket is gaged at the standard 6-in. intervals, starting at 0.4 in. from the breech end, and at important points as shown in the chart, Fig. 9, the mean of the horizontal and vertical diameters being entered. Shrinkage allowances are then made in accordance with the figures given on the same chart, and from these the sizes over the wire, etc., can be entered in the spaces above. Each tube and jacket is numbered, and a book is kept tabulating the sizes of the tubes, from which one is selected to suit the jacket as gaged. Each tube book is a record of the tubes in stock of the various sizes, a separate book being devoted to those regarded as of the A-size, when measured over the wire, another to those of the B-size, another of C-size, and so on. For turning purposes caliper gages are provided and in addition the gage room supplies length rods to suit the jacket, to give the position of the shoulders. Gages are also provided for the curves at the shoulders, being made to gutta percha impressions taken in the jacket itself.

For finish-turning the tube is carried between centers with a steadyrest at about the center of the length (see Fig. 12.) A special form of expanding center is employed at the breech end in order that the tube may be set over slightly if necessary to compensate for any eccentricity of the winding, as in the final turning only 0.026 in. may be taken off the wire as a maximum. In

# ARMY ORDNANCE NEWS

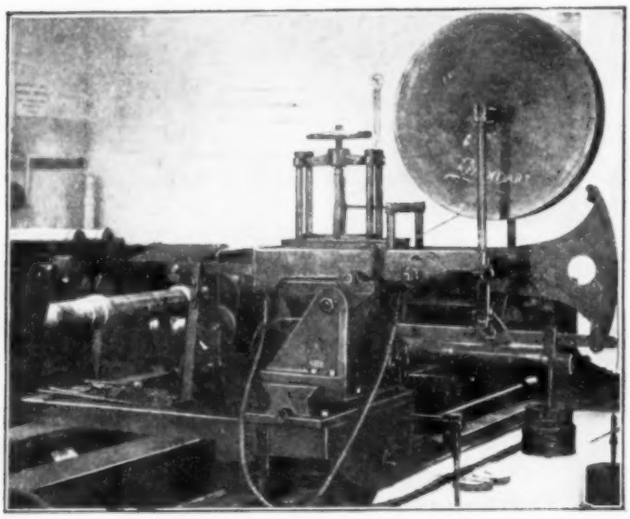


FIG. 8. THE WIRE-WINDING MACHINE

turning it is usual first to true up at about the center for the steadyrest, then turn the wire and carry on down the diameters, finishing at the muzzle end. Usually a fairly straight taper cut can be taken over the wire portion, but the tool is "humored" by the workman to suit the dimensions, and finished, if necessary, at certain parts by means of a file.

Inspectors check the diameters by means of the gages and also check the latter in order to make sure that no alteration has been made, whether wilfully or otherwise.

## THE JACKET

The jacket is received as a square block, sometimes roughly turned at the ends and heat-treated.

Rough-turning is an ordinary lathe operation, the two ends being turned down to within $\frac{1}{2}$ in. of the finished diameter, while 1 in. is left on the length of the part which will eventually form the webs. The lathes on which this work is done have a single speed only, namely, 20 r.p.m. The usual feed is about 16 cuts to the inch., and these cuts are $\frac{1}{4}$ in. deep.

In rough-planing two jackets are machined simultaneously, being held in revolving heads with a copy bar between them to suit the form required. The speed is 25 ft. per min. and the cuts are usually about $\frac{1}{2}$ in. deep with a feed of $\frac{1}{32}$ in. per minute.

In boring from the solid the jacket is held at one end in a bell chuck and runs in a steadyrest on the turned part at the other end. The boring head shown in Fig. 11 is employed, the work commencing at the muzzle end, and when the boring head is half-way through the job is turned end for end to finish. The speed is 50 r.p.m. and the feed 0.5 in. per min. Three tools are used, including a central drill, a lance tool and finally a boring cutter. Following the boring head a D-bit is put right through from the breech end, boring out the jacket from 4 in. to 4.2 in. The speed is again 50 r.p.m. the feed being increased to 0.6 in. per minute.

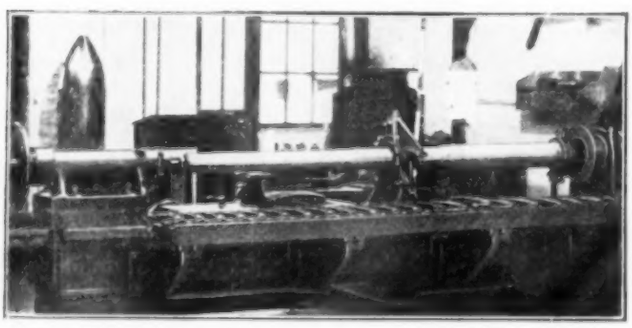


FIG. 10. FINISH-TURNING THE A-TUBE

For step-boring a hollow bar is used bearing three fixed cutters $\frac{3}{4}$ in. square. A brass bushing, 6 in. long, is placed in the hole to support the bar. The various chambers are bored 0.1 in. below the minimum finished size, pin gages being supplied for this by the gage department. The speed is 45 r.p.m. and the feed 0.3 in. per min. The lubricant passes through the center of the bar and is forced out through notches at the side of each tool.

In forming the muzzle and breech it is usual to assume an extra length of $\frac{1}{2}$ in. on the jacket and to measure to the first internal shoulder from the breech end. From a gage the first large external shoulder is formed which gives the external datum point and all other lengths are worked from that. The practice in turning is to leave the diameter 0.02 in. over the size at the breech end, the muzzle end being turned to the finished diameter. The neck at the breech end is first turned, leaving an allowance 0.01 in. for grinding after shrinking. This neck forms a bearing in subsequent operations. All extra allowance of about 0.15 in. to 0.2 in. on the diameter at the breech is to allow for threading. The work at the breech end is completed first, and then the jacket is turned end for end and the muzzle end, being roughed-down near to size, is finished with spring tools and a $\frac{3}{8}$-in. radius tool for the front. The cutting speed is about 50 ft. per min. and the cut 16 to the inch.

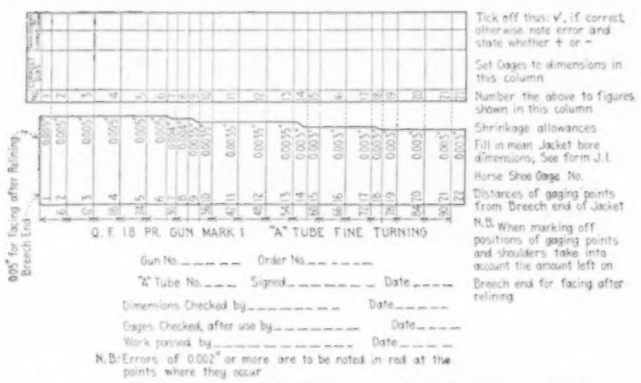

Tick off thus: ✓, if correct, otherwise, note error and state whether + or −
Set Gages to dimensions in this column
Number the above to figures shown in this column
Shrinkage allowances
Fill in mean Jacket bore dimensions, See form J.1.
Horse Shoe Gage No.
Distances of gaging points from Breech end of Jacket
N.B. When marking off positions of gaging points and shoulders take into account the amount left on Breech end for facing after relining
0.005" for facing after Relining Breech End
Q. F. 18 PR. GUN. MARK I "A" TUBE FINE TURNING
Gun No. Order No.
"A" Tube No. Signed Date
Dimensions Checked by Date
Gages Checked, after use by Date
Work passed by Date
N.B. Errors of 0.002" or more are to be noted in red at the points where they occur

FIG. 9. CHART FOR TURNING A-TUBE FOR JACKET

In the second planing operation, Fig. 12, the web is left $\frac{1}{16}$ in. thick overall, that is, $\frac{1}{8}$ in. on the width. About $\frac{1}{16}$ in. is also left on the body, so that the tooling is not completely down to the turned ends, this allowing for warping in the shrinking-on process. The cutting speed is 25 ft. per min. and the feed about $\frac{3}{64}$ in per min., two cuts being taken; while in the planing machine, the jacket is held in revolving heads and is registered from the bore.

# ARMY ORDNANCE NEWS

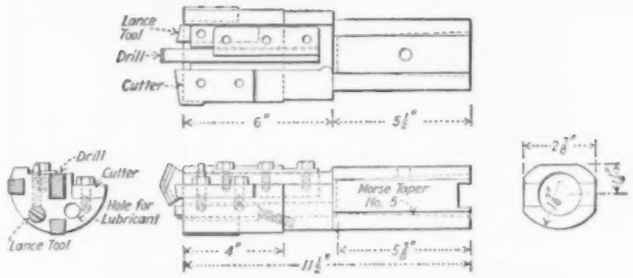



FIG. 11. BORING HEAD FOR THE JACKET

For taper-boring the jacket is held at the muzzle end in a cone chuck with clips and bolts to pull it central. At the breech end it runs in a steadyrest in the neck. The boring bar is piloted in a phosphor-bronze bushing in the headstock of the machine, and at the other end is held in a saddle on the bed. A single-point boring tool is secured in a square hole by means of a screw and lubricant is supplied along the hollow push-rod and through the center of the toolbox. The tool is set by a gage resting on the main boring bar. Adjustable collars are fastened on the push-rod for setting for each length of bore to its shoulder. The final collar on the bar is fixed so as to act as a length check, that is, it is the full length of the bore plus about 4 in. and the positions of the adjustable collars are set with reference to this final collar. The position of the latter is adjusted to the toolpoint when starting the cut at the breech end, and it is set the total length of the gun, plus 4 in. from the end of the block holding the bar on the first saddle. The bore is in five chambers, A, B, C, D and E, starting from the breach, and the first operation is usually to skim up in the D chamber. The C chamber is then finished, two cuts commonly being taken. Next the E section is completed followed by the D chamber, and then the B and A sections. The exact size of bore is determined by the settings of the tool, one for each chamber, and the tool is of course withdrawn by the push-bar saddle. It is usual to work to about 0.04 in. to 0.05 in. below the drawing size, in order to give some extra life to the gun for repairs, but all shoulders are strictly to length. The usual speed is about 18 r.p.m. and feed, $\frac{3}{16}$ in. per min. The bore and chamber are gaged and the readings are charted, Fig. 11, gutta percha impressions being also taken of the shoulders.

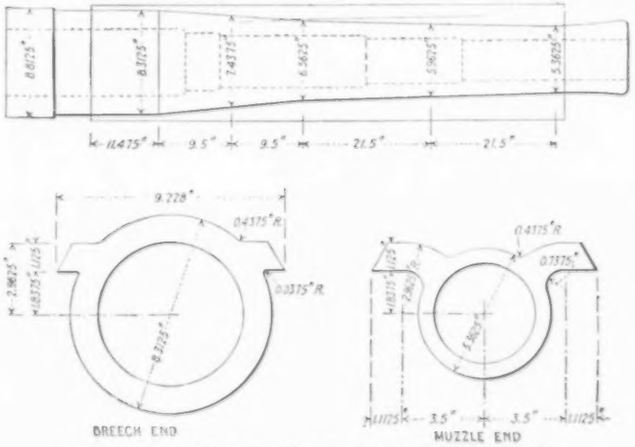



FIG. 12. JACKET AFTER SECOND PLANING

After the jacket has been bored and the corresponding A-tube turned to suit, the two are shrunk together. For this purpose the A-tube is placed over a central vertical tube drilled with cross holes so that water can be discharged onto its interior, the jets keeping it cool while the jacket is being shrunk over it. The tube is secured breech end down, on a stool, with a nut on top of the central water tube. Meanwhile the jacket, also breech end down, is heated in a vertical furnace to about 700 deg. F. at the muzzle end and 550 deg. F. at the breech end. Hinged doors are fitted at the side above the floor level and the removable cover on the top is operated by a balanced lever to facilitate charging and discharging. Gas at city pressure and air at 20 lb. are provided. The temperature is controlled by cocks on the vertical supply pipe and pyrometers are fitted at 3 ft. intervals on the length. It is usual to raise the furnace to about 1000 deg. F., turn off the gas and air, and then saturate the jacket, heating it by radiation. The furnace is of course hotter at the top end, and at this end too the gun has less metal, thus giving the required difference of temperature at the gun ends.

When at the right heat, the jacket is lifted out and carried by crane over the A-tube. Given a slow turning motion, it is lowered over the tube, the ringing sound resulting from the blow at contact informing the shrinker that the bottom shoulder has been hit. If the top end rather than the bottom should seize first, a bush cap is placed over the end of the tube so as to rest on the muzzle end of the jacket and the latter is given a few blows with a sledge hammer. The jacket being home on the shoulder, the water spray is turned on through the rings, of which there are two. The lower ring is fixed near the shoulder position and the water is turned into this first, so that the tube is seized at that position.

The water is allowed to play for about 30 to 45 sec. after which a double movable coil, spreading the water, is turned on and raised slowly along the length of the jacket. This pulls the latter down to each shoulder on the A-tube, which is thus gripped gradually from the breech end upward. In order to determine whether the shrink has been satisfactory, center punch marks are placed in a line on the A-tube, one set of marks being at the breech end and one at the muzzle. The center punch marks are spaced 0.1 in. apart and the innermost of them in each case should be cut by the end face of the jacket. Any straightening required is done in a hydraulic press, and after the straightening the gun is examined to check the work.

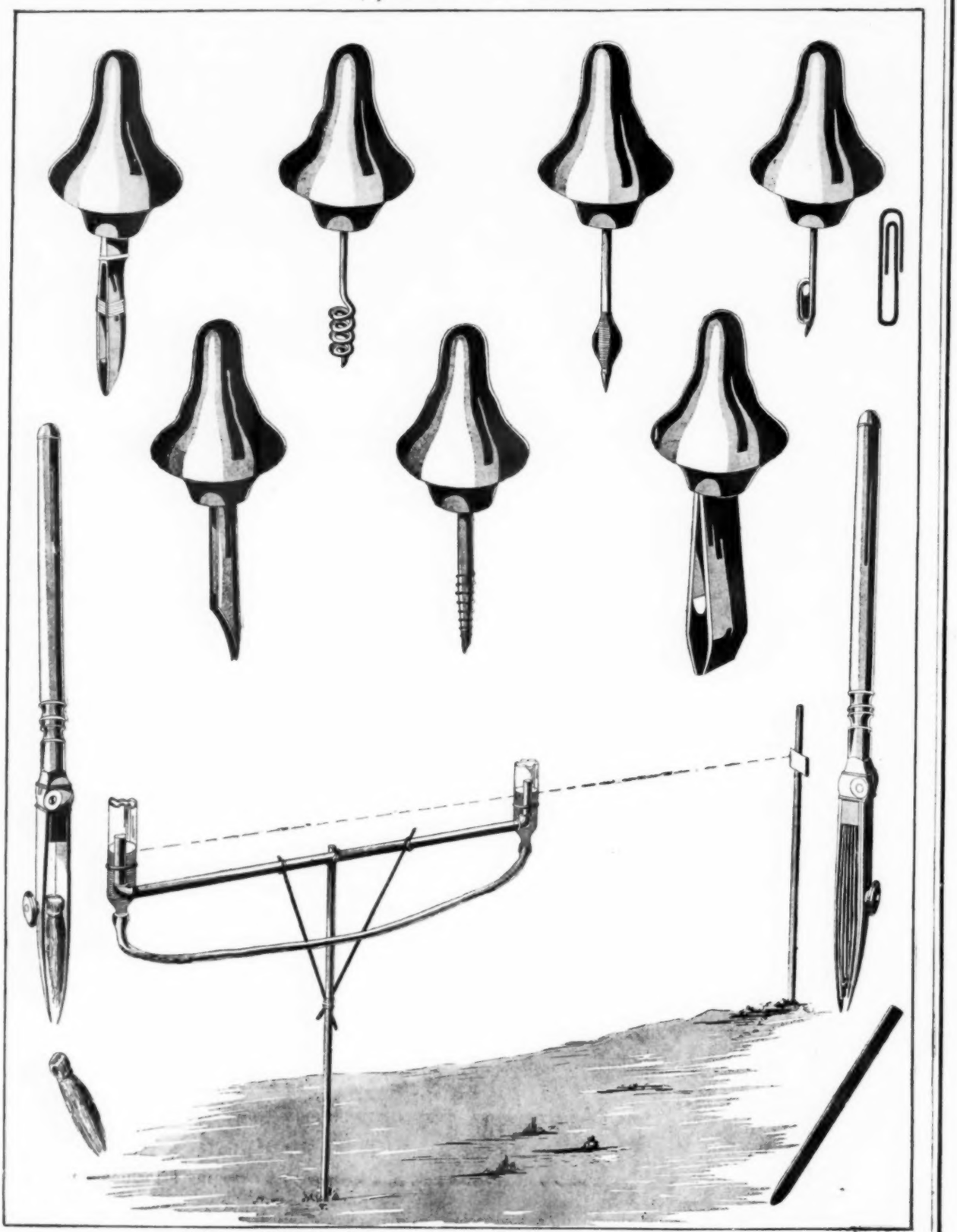
## THE GUN BODY

A bearing is ground at the breech end in which the gun is run when supported in the steadyrest for final boring, etc. The muzzle end of the gun is supported by the tail center and a disk coned to suit the rounded end of the muzzle. The breech end is secured in a 4-jaw chuck, the neck to be ground being set as true as possible, and then with a grinding attachment fixed on the lathe carriage, the bearing surface is given a true finish, to remove ovality and bring it between the high and low limits as to diameter.

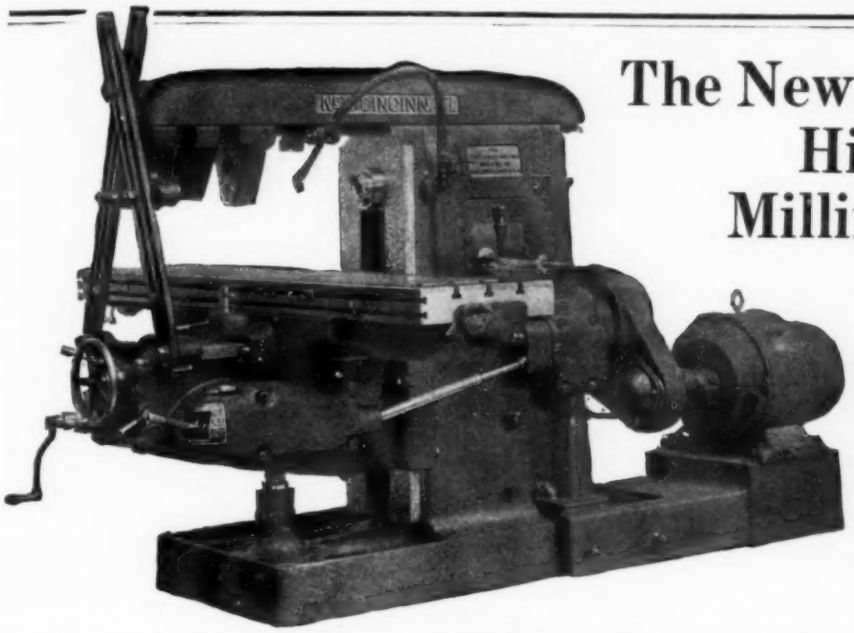
*(To be continued in next issue)*

# FOR SMALL SHOPS *and* ALL SHOPS

*By J. A. Lucas*



INKING DEVICES AND IMPROVISED LEVEL FOR DRAFTSMEN



# The New Cincinnati No. 4 High-Power Milling Machines

***The machines described in the following article, made in both the plain and universal types, are recent additions to the line of the Cincinnati Milling Machine Co. In design these machines are identical with the new No. 5, which was described in the "American Machinist" on page 971, Vol. 50.***

ANTICIPATING the demand for increased operating convenience and maximum rigidity under cutting conditions, the Cincinnati Milling Machine Co. has applied to the No. 4 size plain and universal machines the features in design which were recently described in the *American Machinist* in connection with the No. 5 size machine. The most important of these features are: intermittent feed with power quick traverse and return, square gibbed bearings with narrow guides, rectangular overarm, and original features in control and driving details. The reader is referred to pages 971 to 976 of Vol. 50 for an extended description of the operation and construction of the speed and feed units of the No. 4 which are identical with those described at length in the previous article.

The illustration which forms a part of the headpiece on this page shows the No. 4 machine of the plain type, arranged for motor drive through gears. The motor recommended for this service is of 15-hp. capacity. Fig. 1 shows a different type of motor drive for this same size and type milling machine. In this case the drive is through a belt, the tension of which is kept automatically correct by means of the swinging motor baseplate, which is pivoted on its inner end to provide the proper leverage. The standard construction of this machine, both in the plain and universal types, is of course with constant-speed pulley drive.

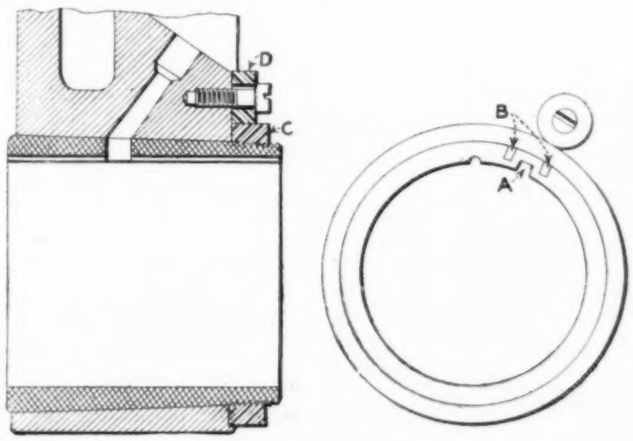



FIG. 2. LONGITUDINAL AND CROSS-SECTIONS THROUGH ARBOR SUPPORT BEARING, SHOWING ADJUSTMENT

There are two features in this machine which were not elaborated upon in the article descriptive of the No. 5 size, and which will be of interest to *American Machinist* readers. One of these is the adjustable arbor support and the other the station type system of lubrication. The outer arbor bearings as a general practice in milling-machine construction are not made adjustable. In this design an adjustable bearing is provided, so that wear may be taken up and the possibility of chatter eliminated. Fig. 2 gives cross and longitudinal sections through the outer support, and shows the means by which this adjustment is secured. The inner sleeve is slotted part way through its length, both on the inside and outside, as shown at *A* and *B*. This provides sufficient elasticity to enable a contraction of the perimeter to take place upon tightening the knurled nut *C* which draws the tapered sleeve into its seat. The outside of the adjusting nut is knurled, and bears against the knurled check ring which is held in place by a fillister-head screw and locks the adjusting nut *C* in the required position.

FIG. 3. ONE OF THE OILING STATIONS, SHOWING DUST CAP PARTLY OPEN

The station-type system of oiling and particularly the form of station provided for this purpose is an interesting innovation. One of these stations is shown in Fig. 3. It consists of a malleable oil cup of generous proportions, having a swinging dust cover. Within this cup is a steel diaphragm, having as many openings as there are oiling points to be fed from the station. Brass oil tubes are expanded into these diaphragm openings, and lead to the various oiling points. The design

of these oiling stations is standard except for the number of openings in the steel diaphragms, which may vary from 1 to 7 or 8, as required.

The following are specifications which are common to both the plain and universal types of the No. 4 machine: table, 68 in. long by 19 in. wide, provided with three ¾-in. T-slots; power quick traverse and reverse in either direction, 100 in. per minute; range of feeds, 42 in. longitudinal, 14 in. cross, and 20 in. vertical, all power feeds in either direction; driving pulley, 16-in. diameter, 5-in. belt, and runs at 600 r.p.m.; motor recommended, 15 hp. constant speed; spindle, $4\frac{1}{16}$-in. diameter in front bearing, No. 14 B. & S. taper hole, 1¼-in. diameter hole through, and runs in babbitted bearings adjustable for wear; Cincinnati standard flanged end; spindle speeds, 17, 21, 26, 32, 41, 52, 65, 80, 102, 128, 159, 196, 248, 310, 388 and 480 revolutions per minute in either direction; full width, 37½ in. between face of column and braces; overhanging arm, rectangular, 9½ x 8¾ in., with V-guides; overarm adjustment by rack and pinion; arbor supports, three supplied as standard equipment, two with adjustable sleeve bearings and one bronze bushed; feed, positive, 16 changes in geometric progression varying from ¾ in. to 30 in. per minute; change gears provided if required for feed series varying from ⅜ in. to 15 in., or 1¼ in. to 45 in. per minute; centrifugal pump, 11 gal. capacity for cutter and work cooling; floor space, 105 x 130 inches.

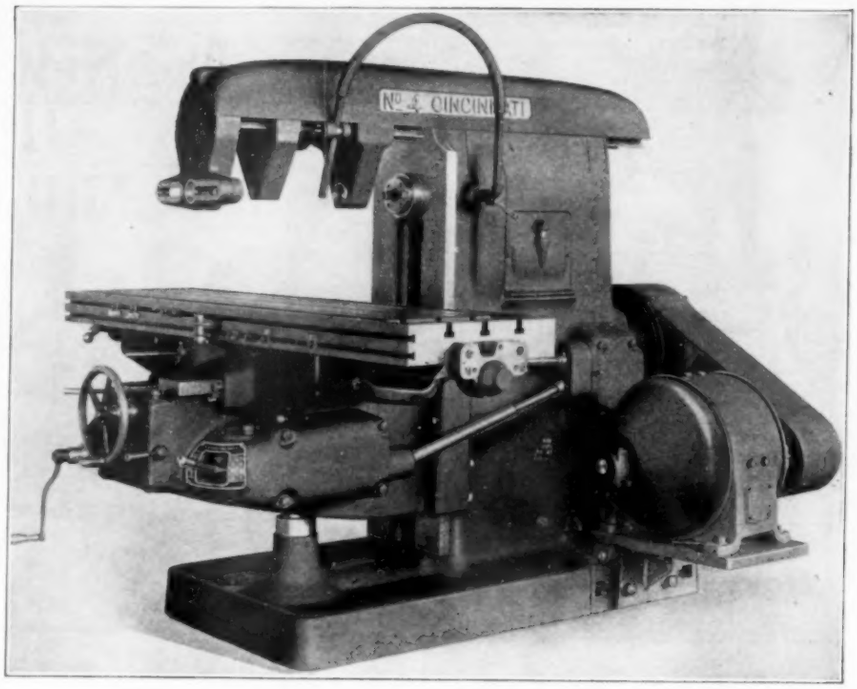


FIG. 1. NO. 4 PLAIN TYPE MACHINE WITH MOTOR, AS ARRANGED FOR BELT DRIVE

### Specifications of the Plain and Universal Types of Machines

The following specifications apply particularly to the plain type of machine: intermittent feed controlled automatically by dogs, giving fast, slow, and reverse for table movement; net weight, belt driven, 8900 lb., belted motor driven exclusive of motor, 9200 lb., geared motor driven exclusive of motor, 9600 pounds.

The following specifications apply particularly to the universal type: table swivels 47 deg. right or left; dividing head swings 14 in., take work 45½ in. long, indexes all numbers to 60, all even numbers and those divisible by 5 to 120; net weights, belt driven, 9600 lb. belted motor driven exclusive of motor, 9900 lb.; geared motor driven exclusive of motor, 10,300 pounds.

## Army Methods of Selecting Men

By John T. Clark

While reading the article, "Applying Army Methods of Selecting Men for Industry," on page 409 of the *American Machinist*, the thought came to me that possibly the impressions of a shop man might be of interest to your readers.

During many years of experience in the machine business I have come across many make-believe machinists who, having acquired a little book learning, can readily answer such questions as are listed in the article above mentioned, but whose productive ability is conspicuous by its absence; while on the other hand there are many men who are excellent machinists though they do not know that "pitch" and "lead" are not necessarily synonymous terms; nor do they know the name of any standard taper or its amount of taper per foot.

It would seem to me that if the employment manager understands the work which the men he hires are expected to know and do, it will not be difficult for him to formulate such questions that, when put to applicants, will easily indicate their knowledge and ability.

A good way, in my mind, of testing and selecting men for jobs would be to keep in the employment office sample drawings of work done in the various departments of the shop; and when a man applies for a job, after the preliminary questions have been answered and it has been determined what department he is most suitable for, give him a drawing of the work that he would be expected to do; let him study it for a few minutes, during which time another applicant could be interviewed, and then have him explain just how he would set about doing the job. If the agent knows the business as well as he should, he will readily be able to judge whether or not the applicant is a capable workman.

Where such questions as are in the article under discussion are used, a man with very little practical experience but possessing a little knowledge that can be obtained in a few minutes from any apprentices' handbook could easily get by; whereas a man with years of good sound experience in mechanical work, worthy of a job in any machine shop but denied an opportunity to demonstrate his ability by an actual try-out, might fail.

You may ask all the questions that could possibly be thought of, but, after all, the only certain way of determining a man's fitness for a job is to give him a chance to prove it in actual practice.

# Effects of the Chemical Composition of Welding Electrodes

By J. S. ORTON

*Research work in the electric-welding field received a great impetus as a result of the work of the Shipping Board. Here are the results of a short test undertaken to determine the effects of the chemical composition of the electrode on the strength of the weld.*

IN ORDER to ascertain to what extent the chemical analysis of an electrode affected the welded material in electric arc welding, two electrodes *R* and *W* were chosen of widely different chemical analyses, each 0.148 in. in diameter. The *R* electrode was within the specifications of the Welding Research Committee except that the silicon content was a little high. The analyses were as follows:

| | C | Mn | P | S | Si |
|---|---|---|---|---|---|
| *R* wire ..... | 0.17 | 0.57 | 0.007 | 0.028 | 0.14 |
| *W* wire ..... | 0.39 | 1.01 | 0.005 | 0.024 | 0.12 |

The silicon content was rather high, but inasmuch as it was fairly constant in both electrodes the results are comparative.

A deposit was made on a ½-in. plate by means of a metallic arc, the welded section being approximately 1 ft. long, 6 in. wide and 1 in. thick. The welding machine used was of a well-known make, with a constant voltage of 37 volts at 130 amperes. The plates used for depositing the first layer were machined away and two test bars were made from each electrode, composed entirely of welded material. The ends were rough-machined and about 4½ in. in the middle of the specimens were finished carefully—so that the pieces had the shape shown in Fig. 1.

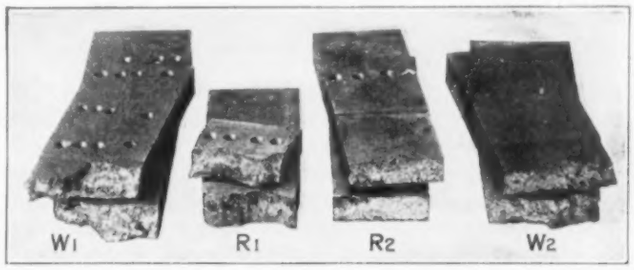



FIG. 1. FRACTURES OF TEST SPECIMENS

The physical characteristics of the plates are as shown in Table I.

After these bars were pulled, chemical analyses were taken at various points to get the values given in Table II.

Photographs of the different fractures are shown in Fig. 2. *W-1*, which gave the highest tensile strength,

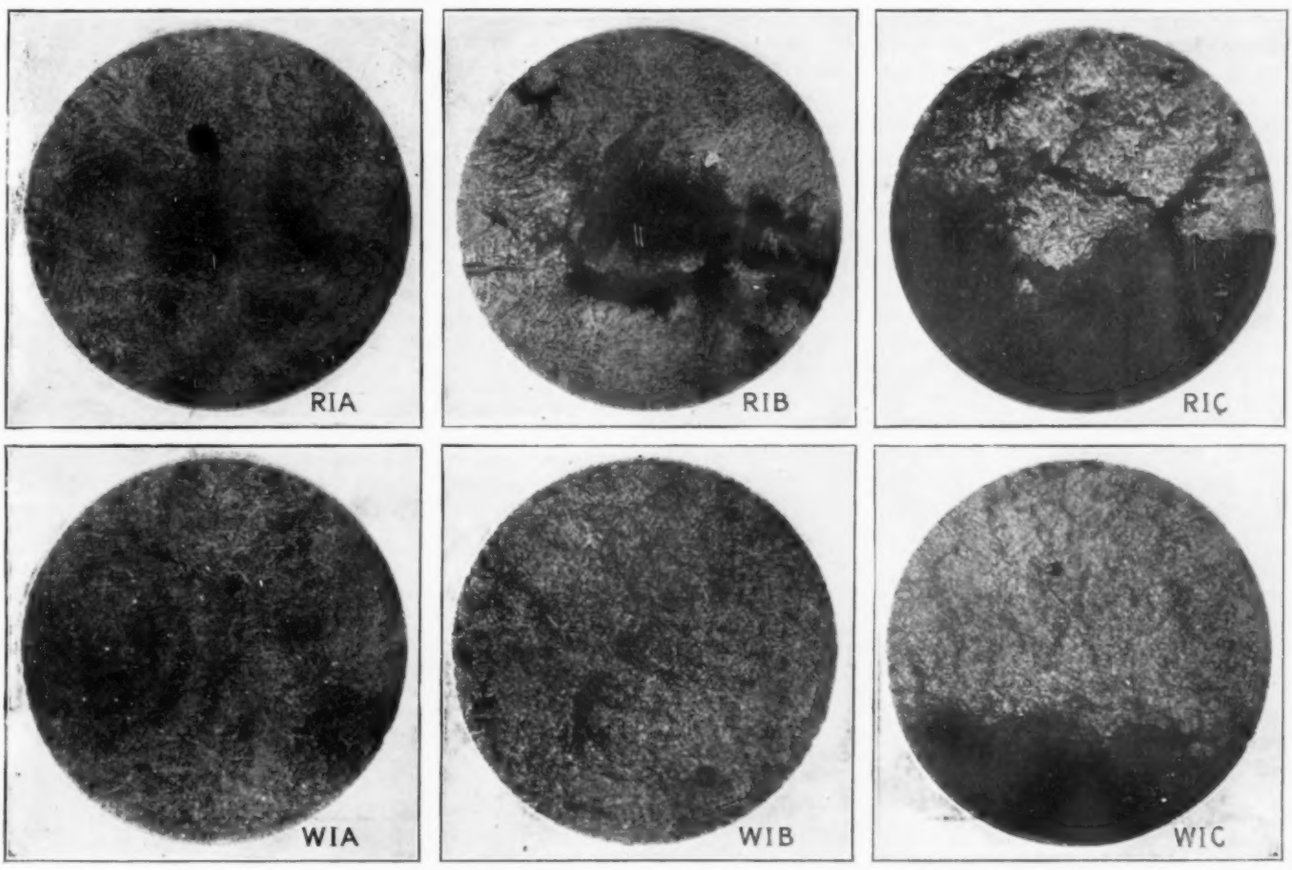



FIG. 2. MICROPHOTOGRAPHS OF DIFFERENT SPECIMENS

shows 100 per cent. metallic structure with a silky appearance. *R-1* showed a coarse intergranular fracture. *R-2* showed a brittle, shiny crystalline fracture with a slag inclusion at the lower left-hand and upper right-hand corners of the bars. *W-2* shows partial crystalline and partial silky fracture. At the extreme right there is a portion which is not welded. This is probably the reason why *W-2* did not pull as much as

TABLE I. PHYSICAL CHARACTERISTICS OF PLATES

| | Tensile Strength | Elastic Limit | Elongation | RA Brinnel |
|---|---|---|---|---|
| *R*-1 | 57,300 | 43,400 | 8.0 | 15 3 |
| 2 | 56,050 | 50,500 | 6.0 | 5 9 |
| *W*-1 | 76,200 | 64,000 | 7.5 | 13 0 |
| 2 | 72,650 | 60,260 | 5.5 | 7 1 |

the other. Undoubtedly, next to the chemical analysis, the quantity of slag in the weld has the biggest bearing on the tensile strength.

The structure of the test specimens is shown in the microphotographs of Fig. 2. In making these photographs, no attempt was made to make a complete micro-analysis of the two different specimens, but rather it was intended to show the general difference in structure between the two different types of electrode. All of these photographs were taken at 150 diameters except the last two, which were taken at 100.

Photograph *R1-A* shows the general structure of the plate welded with the *R* electrode. This photograph

TABLE II. CHEMICAL ANALYSES OF SPECIMENS

| | C | Mn | P | S | Si |
|---|---|---|---|---|---|
| *R*-1 | 0 12 | 0 23 | 0 012 | 0 019 | 0 10 |
| 2 | 0 09 | 0 24 | 0 016 | 0 014 | 0 08 |
| 3 | 0 11 | 0 26 | 0 014 | 0 020 | 0 08 |
| *W*-1 | 0 23 | 0 84 | 0 014 | 0 012 | 0 02 |
| 2 | 0 20 | 0 80 | 0 014 | 0 014 | 0 05 |
| 3 | 0 20 | 0 88 | 0 013 | 0 013 | 0 02 |

shows a large-grain growth and columnar structure which are characteristic of electric welds. Photograph *W1-A* shows the general structure of the plate welded with the *W* electrode. This shows comparatively small-grain structure. The structure seems to be much better than that of *R1-A*. Photograph *R1-B* shows a portion of a test specimen which was cut out of plate *R1* and bent to an angle of 10 deg. It is interesting to note here the opening up of the welded material adjacent to slag inclusions. Photograph *W1-B* shows a portion of a small specimen cut out from sample *W1* and bent to an angle of 10 deg., the same as in the case of *R1-B*. The welded material is opening up but not in the same degree nor around the slag inclusions as in the corresponding photograph *R1-B*. Photograph *R1-C* is a profile of the fracture of the *R1* sample after bending through an angle of 15 deg. Photograph *W1-C* shows the *W1* sample after being bent through an angle of 17 degrees.

It seems just as important to specify the chemical composition of the electrode used in electric arc welding as it is to specify the chemical composition in ordering any other type of steel.

Chemical composition seems to affect the physical properties in electrodes as well as other steel.

An excess of manganese seems to be needed in electrodes.

The relation between the carbon and manganese of an electrode should be approximately one to three.

High-carbon manganese wire tends not only to improve the weld on account of the amount of carbon and manganese in the welded material, but also on account of the type of structure which this wire lends to the deposited metal.

There is a smaller amount of oxide and slag inclusions with a high-carbon manganese wire than with a comparatively low-carbon manganese wire.

## Practical Tolerances of Machine Parts

The Bureau of Standards is conducting an investigation with the object of securing information regarding the tolerances on tools and machine parts recommended by various manufacturers and which have been found to work out well in their own practice.

A questionnaire has been issued containing 17 questions and two blank sheets which are arranged for entering data in tabular form:

1. If you are establishing tolerances on your work in accordance with a system or table of allowances and limits for various kinds of fits, such as shrink, driving, running, pulley, and sliding, it is requested that a copy of such table be furnished.

2. For each class of work or machine which you manufacture, what tolerances are applied on the dimensions of fitting parts? This information can be transmitted by detailed blueprints.

3. In assigning tolerances to parts, do you take the hole as basic, or the shaft?

4. Are tolerances given on blueprints rigidly adhered to or are they exceeded, and to what extent, by the actual working variations which occur and are permitted?

5. How do you express tolerance on component drawings? For example:

$0.675\ ^{+0.006}_{-0.000}$, or $\frac{0.681}{0.675}$, or $0.678 \pm 0.003$, or some other system.

6. In general, to what accuracy are you able to do work on various standard types of machine tools such as lathes, milling, grinding and shaping machines, etc.? If you have used any non-ferrous metals, to what accuracy can they be worked?

7. In ordering machine tools, what accuracy do you specify on such items as feed and lead screws, gears, etc.? Or, if you are a manufacturer of machine tools, what accuracy do you guarantee?

8. If you buy your parts, either finished or partly finished, do you specify the limits to be used, or does the manufacturer of the part set his own limits?

9. To what extent are the parts of your machines interchangeable?

10. To what extent do you conduct inspection work in your plant? Information as to the inspection facilities and organization, system of inspection in the shop and assembly room, extent of use of gages, and similar information is desired.

11. Do you permit the inspector to use larger tolerances than the workmen?

12. Do you make any attempt to have the gages used by the workmen within the limits of the gages used by the inspectors?

13. Do you conduct inspection to obtain complete interchangeability, and what other objects do you endeavor to attain by your inspection system?

14. What relation is maintained between tolerances permitted in the manufacture of your gages and the tolerances assigned to the part to be gaged?

15. What allowance in tolerances, if any, do you make for parts that will work under high temperatures?

16. In the case of shrink, press, and drive fits, do you modify the allowance for differences in lengths of contacts? That is, should the allowance on diameter for a hub measuring 6 in. along the shaft be the same as for a hub measuring 1 in. along the shaft?

17. Are you as a manufacturer interested in a report covering such points as brought out in this questionnaire?

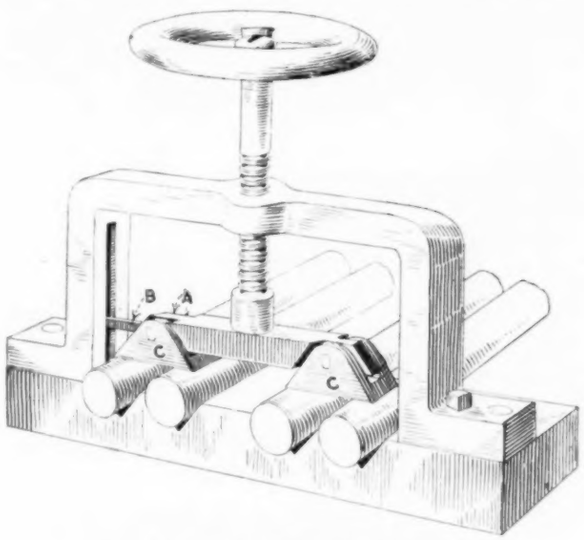
Any information in regard to the questions should be sent to the Gage Section of the Bureau of Standards. Washington, D. C.

## A Handy Multiple V-Block Milling Fixture

By W. H. Addis

This fixture illustrates a principle which with variations will permit the rapid and efficient clamping of a number of pieces of round stock at one operation.

The clamping member *A* is an equalizing bar loosely




A HANDY MILLING FIXTURE

fixed to the screw by a swivel joint and prevented from swinging by the guide pin *B*. At each end are pads *C* loosely pinned to the equalizing bar. This construction permits the pads to adjust themselves to the work and, as shown in the illustration, four pieces of stock can be firmly clamped by a single turn of the handwheel. This wheel should be of generous proportions so as to quickly and rigidly clamp the work by exerting only a slight pressure on the wheel.

## Rotary Bushings

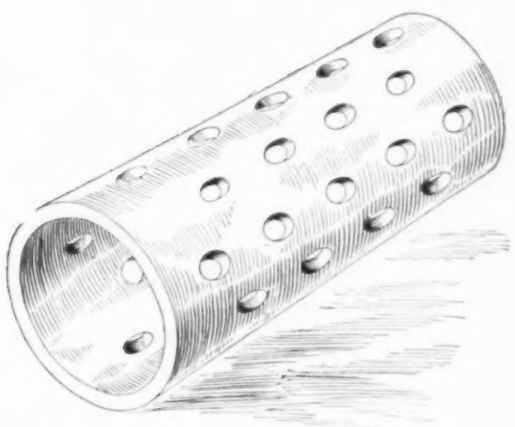
By E. A. Dixie

The illustration shows a small but important detail of construction used by very few manufacturers. It is a loose bushing which takes a bearing both inside and out. Occasionally, one sees it used as a cure for loose-pulley trouble after the pulley hub has been all cut to pieces and the shaft chewed up. Its proper place, however, is in new machinery where if properly installed there will be no trouble so far as it is concerned.

The pulley hub or body of the machine is bored a running fit for the outside of the bushing shown. The bushing can be of cast iron or bronze. In the writer's opinion, cast iron is preferable to bronze, provided care is taken when the machine is first run to have it liberally oiled.

The shaft is turned or ground a running fit for the inside of the bushing. Thus made, the bushing is free to turn in the body of the machine and the shaft is free to turn in the bushing with the following result:

The shaft of the machine makes, for instance, 300 turns per minute. The friction of the well-oiled shaft on the inside of the bushing tends to cause the bushing to turn with the shaft but the friction of the well-oiled exterior of the bushing in its seat in the body of the machine prevents the bushing from turning as rapidly as the shaft. Just what this lag is I do not know and so far as I am aware it has not been measured



ROTARY BUSHING USED IN MACHINE CONSTRUCTION

as it varies with certain conditions even in the same machine. It is reasonable to conceive of a condition where the opposed frictions of the outside and the inside are so balanced that the bushing makes 150 turns while the shaft makes 300. This would mean that with relation to its bearing the shaft of the machine is making 150 turns per minute only.

Units thus mounted have, after years of service, been examined and the bearing surfaces both inside and out found to be practically perfect.

The writer has seen bushings of cast iron used on shafts 4 in. in diameter. In this case, the bushing was about ¼ in. thick and the holes were about ¼ in. in diameter.

For very small bushings used in high-speed spindles bronze was used, as cast iron of sufficient strength

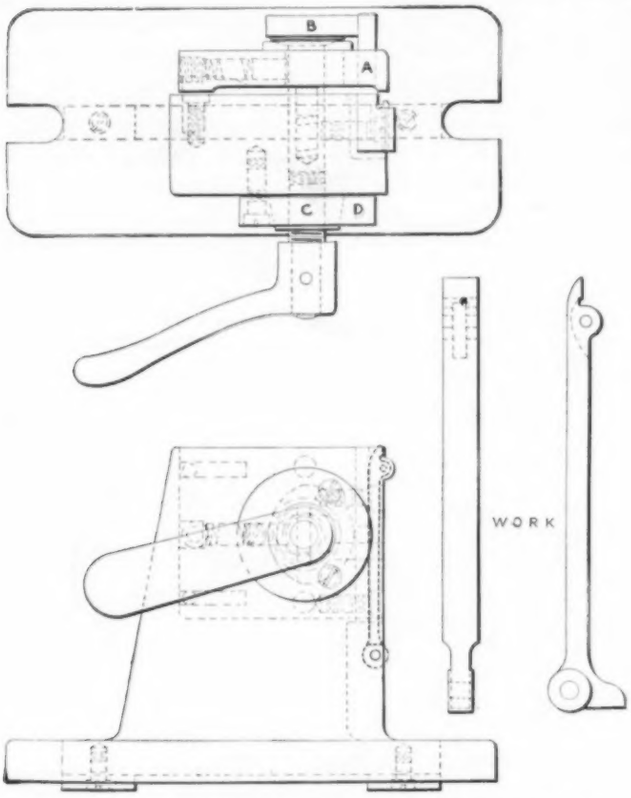
would have been too heavy. On spindles $\frac{3}{8}$ in. in diameter the bushings were $\frac{1}{16}$ in. thick and the holes about $\frac{1}{8}$ in. in diameter. The spindles in these cases ran several thousand turns per minute without giving any trouble.

## Simple Clamping Fixture for Milling Operation

By H. M. Fay

A clamping fixture for holding an awkward-shaped piece in which the clamping is accomplished by one movement of a single lever, is shown in the accompanying illustration.

A cast-iron base carrying a rectangular upright projection somewhat higher than the length of the work




SIMPLE SINGLE-MOVEMENT CLAMPING DEVICE

is tongued on the bottom to locate it on the milling-machine table. A piece of tool steel machined to conform to the shape of the part to be milled, and permanently fastened in one corner of the upright projection, serves as the locating member of the device, while the movable clamp *A* grips the work.

A pin in the fixed jaw, fitting into a previously drilled and reamed hole in the work, assists in locating the latter but makes it necessary to slide back the movable jaw in order to make room for the removal and setting in of the work.

As the object of this fixture is to clamp the work with one movement the clamp is provided with a spring and plunger bearing against the clamping bolt which serves to push the clamp back out of the way as soon as it is free to move. A cam *B* on the end of the clamping bolt bears upon a stud set in the clamp, and upon movement of the clamping handle, pushes the clamp into holding position.

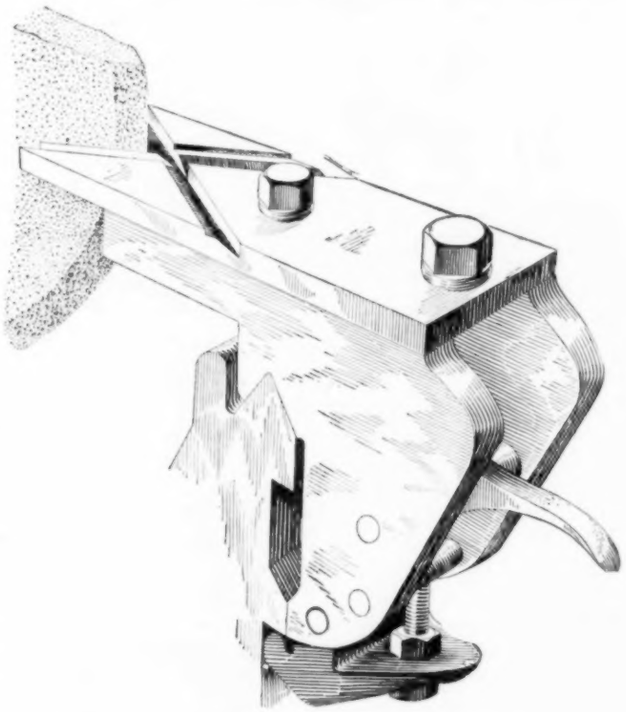
In order to make this movement come in proper relation to the clamping movement, and also to provide means of compensation for wear, the nut *C* is made round and held in position by the clamping collar *D*. To adjust, it is only necessary to loosen the collar and turn the nut by means of a spanner. The operating handle is pinned to the clamping bolt and the head of the latter forms the cam *B* that moves the clamp forward.

The operation to be performed is the milling of the recess in the face of the work.

## A Handy Truing Device for V-Faced Wheels*

We are frequently confronted with a need for a special arrangement for truing the face of grinding wheels to some special shape, and the V-type of wheel face is one which is used a great deal on certain grinding operations, particularly in the toolroom. So we are illustrating here a little fixture we have seen in operation which, in the hands of a careful operator, yields very good results.

The diamond is mounted in the slide and when placed in the grooves on the master plate can be guided



DEVICE FOR SHAPING GRINDING-WHEEL FACE

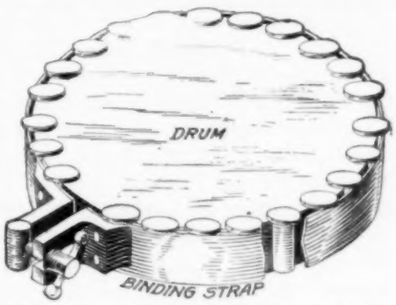
across the face of the wheel, which can be trued up to any desired angle, by having plates with different angles in them. A convenient way for mounting this master plate is to take an old steadyrest body which has been worn out and machine it off to permit the plate to be mounted on its top, thereby leaving a bracket to clamp on the table of the Norton machine in the regular manner. The illustration is clear enough to need no further explanation.

*By Howard W. Dunbar in "Grits and Grinds." (The Norton Co., Worcester, Mass., March, 1919.)

# A Jig for Grinding Push-Rods

By J. J. McIntyre

We had a job a short time ago to grind 7000 carbonized push-rods—the top surface requiring a ground finish. We first milled 20 semicircles in a cast-iron drum, making them all of the same depth as the shanks of the push-rods were of a uniform diameter. The push-rods were set in these half circles, and held by a binding strap so made that it could be tightly clamped by means of a wing nut. The loaded jig was then placed on the magnetic chuck of a Persons-Arter grinding machine. The illustration shows the set-up. With this arrangement a load was finished in four minutes.



DEVICE FOR GRINDING PUSH-RODS

# Universal Die Plate for Forge-Shop Bending Machines

By A. S. Hesse

It is possible to get a greater degree of convenience on some types of forge-shop bending machines by putting on a universal die plate in order to attach the dies more readily to the machine. This universal die plate is shown in Fig. 1 at *A* and is made in two parts, *B*, which is a flat plate, and *C*, which is a separate head plate. In the sketch the die end (back stop) of the bending machine is indicated by the dotted lines.

The flat surfaces of both plates are provided with holes through which countersunk bolts are placed to hold them to the bed of the machine, and they also have the holes *D* for T-head bolts, which can be placed as needed for holding the dies.

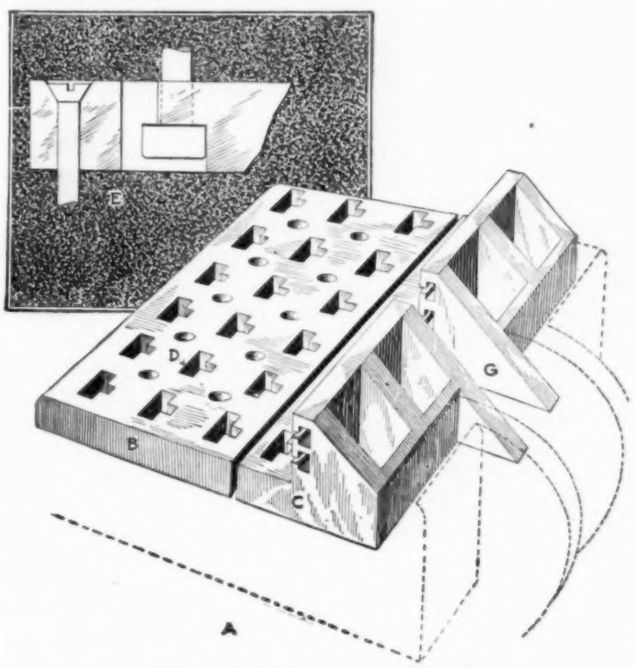


FIG. 1. UNIVERSAL DIE PLATE

The sketch *E* shows the manner in which the countersunk holding-down bolts are placed and also a section through the holes for the die-holding bolts. It is a fact borne out by experience that you cannot get too many work-holding bolts in a plate of this kind, because occasions will arise with widely spaced bolts when the workman could gain decided advantage in putting his dies on the plate if he just had a few more bolt holes.

Be sure to have these slotted holes point the right way, because this plate is stationary and the pressure of the dies is toward the back stop. Round off the corner *F* of the main bottom plate to leave little chance of catching the dies mounted on the head of the bending machine provided these should shift in service.

The plate should not be less than 2 in. in thickness, and 2¼ in. or more is better, as a machine operator is apt to do considerable pounding on the plate in straightening pieces that do not come off the dies to suit him. Occasionally it may be necessary to put this plate on a planing machine and dress off its top surface.

The part *C* for the back stop is provided with two horn-shaped pieces *G*, extending from its rear through the ways of the back stop. When bending very wide stock on high dies it is advisable to block up under these with a wedge to prevent any rocking of the head stop.

I have found it serviceable to use this plate in the manner indicated at *H*, Fig. 2, and I have provided it with planed cast-iron blocks of the requisite height, so that

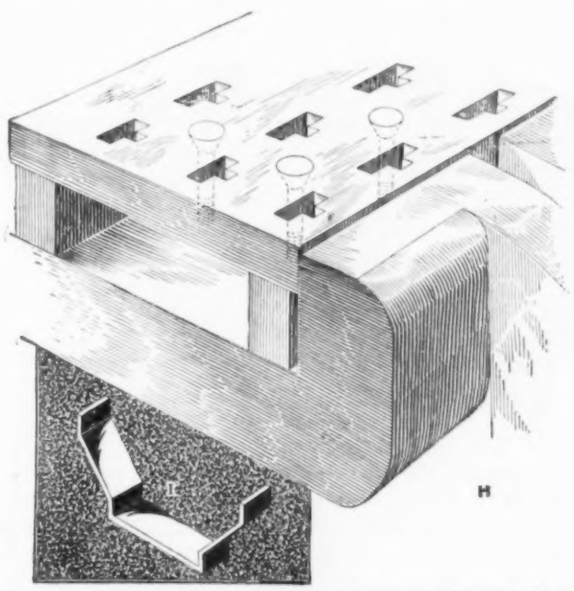


FIG. 2. SPECIAL ARRANGEMENT OF DIE PLATE

it may be pushed up against the back stop of the bending machine and blocked up to a sufficient height so that work bent on it will clear the back stop. This is especially desirable when using large wing dies for bending such parts as that shown at *I*, as otherwise there is a chance of interference between the wings of the die and the back stop.

The plates usually made for this work will be about 6 ft. in length, and the bottom plate *B* will be about 24 in. wide, while the head plate *C* will have a die-holding space 12 in. in height. Such plates will weigh in the neighborhood of 2000 pounds.

# EDITORIALS

## More Pay for Educators

FRIENDS of technical education are loath to see it starve to death from malnutrition—which is exactly what is happening to education, both technical and general, in America. The remedy is more nutrition; in other words, more pay for educators.

The average instructor is paid today an average yearly stipend of twelve hundred dollars—less than a barber, less than a first-class stenographer, less than a fireman or policeman, even less than a street sweeper. Compared with the instructor, who has spent years in brain cultivation, the hod-carrier is a Crœsus, and a railway conductor beyond the dreams of avarice.

Nor is the full-fledged professor in much better financial shape in return for many years of tedious mental preparation. A full-fledged professor at Harvard, which is perhaps the institution that leads all others in rate of professional pay, gets between four thousand dollars and five thousand and five hundred dollars per year.

The graduates of Harvard University and of the Massachusetts Institute of Technology realize the serious danger that confronts education. To meet it, they plan a drive to raise a fund of eleven million dollars, the first application of which will be to add fifty per cent. to instructors' and professors' salaries.

It is the expectation of the committees in charge of this fund that men of wealth everywhere, and particularly the industrial leaders, will realize the importance of thoroughly trained men in all branches of industry and science, and will give largely to this fund.

If Harvard, with its huge endowments, its Alumni of approximately thirty-seven thousand, including those who have been under the influence of the university in one department or another, finds her situation serious, what must it be for the various engineering schools and smaller endowed institutions of learning throughout the country. If Harvard finds it difficult to retain the services of suitable men on the faculty, with its scale of salaries, what must be the struggle in institutions where professors have the possibility of getting, not five thousand and five hundred dollars, but two thousand and five hundred dollars, and even less, as a reward for a lifetime of devoted service. In engineering schools particularly, the war developed a serious situation. Men who had determined upon a career of teaching, found first that it was difficult to provide even the bare necessities of life on their salaries, unless they were fortunate enough to have private means or outside income. Besides this, many found, for the first time, real opportunities to render service with large manufacturing or engineering companies where the prospects of greater comfort in life and secure old age lured them from their chosen profession.

Friends of technical education must see to it that these outside attractions do not rob our institutions of those who teach. The remedy is more nutrition. Unless this is provided, and provided quickly, the next generation will find itself crippled by a shortage of technical talent.

## Ominous Figures

THE *New York Tribune* prints a table of strike statistics, gathered by a private statistical bureau, which, although they are not complete enough to form a basis for very definite predictions or opinions on the labor situation, at least afford food for thought.

The principal value of the figures appears when they are compared with the figures for a year ago. The present number of strikes is more than double that of last August. It may not be quite fair to compare present conditions with those of last year because both periods are abnormal. Then we were straining every nerve to produce war materials and now we are still in the throes of reconstruction. Making every allowance for these differences, it seems certain that the trend is in the direction of more rather than fewer strikes.

A diminution of production is a natural consequence of an increase in the number of strikes. Coming just now when the authorities are endeavoring to stimulate production in an attempt to lower prices, it is doubly unfortunate.

The *Tribune's* investigator sums up his work in three brief statements which we quote: (1) There has been a very pronounced and progressive decline in actual quantity of goods produced. (2) Shorter hours and higher wages have not been compensated for by increased efficiency. (3) There is great need for authoritative and prompt statistical data on the state of labor.

There can be no question as to the soundness of the third conclusion. As to the first one, there seems to be room for doubt in view of the very inadequacy of information to which attention is called in the last conclusion. It is based however on the best figures obtainable and these are taken from the same sources for the different periods, a method which should minimize the unavoidable errors.

Of the three conclusions, the second is the most significant. Here again, suitable figures are not available and conclusions must be drawn from the opinions of as many representative business men, labor commissioners, and bankers as possible. As would naturally be expected of opinions from such varied sources, the percentages of estimated decrease in efficiency run all the way from ten to forty.

If this is the result of increasing wages and shortening hours, where is it going to lead us? Are the American people going to dip eagerly into their trouser pockets to pay a certain small minority an extra amount for which they get absolutely nothing in return? We hardly think they will do it very long. The average citizen has to work too hard for his money to get rid of it in that way.

Any body of workmen that will guarantee to produce the same amount of work in forty-four hours that they have been doing in forty-eight hours will probably have little difficulty in securing the shorter week with the longer pay from any manager worthy of the name. But unless production is maintained there seems to be no valid reason for further reducing working hours.

# Remarkable Feat of Engine Assembling

By B. M. DAVIS

HAVING helped to assemble marine steam engines both here and in Great Britain, the short article under the above caption in a recent issue of the *American Machinist* interested me sufficiently to cause me to find out how it was possible to do this job in so short a time. The answer is good judgment and tools.

It is not my intention, even if I were able, to go into a detailed account of just how all the work was finished ready for assembling, but examples will be shown of the efficient use of machine tools whereby assembling difficulties were eliminated.

In Fig. 1 is shown a Sellers' 14 x 10 x 30-ft. planing machine. The joints of the bed sections, one of which is shown at *B*, are all planed at one setting, after which the bolt holes are bored and the entire bed assembled. It is again put back in the planing machine and the seats for the columns and the openings for the main bearings planed at one setting.

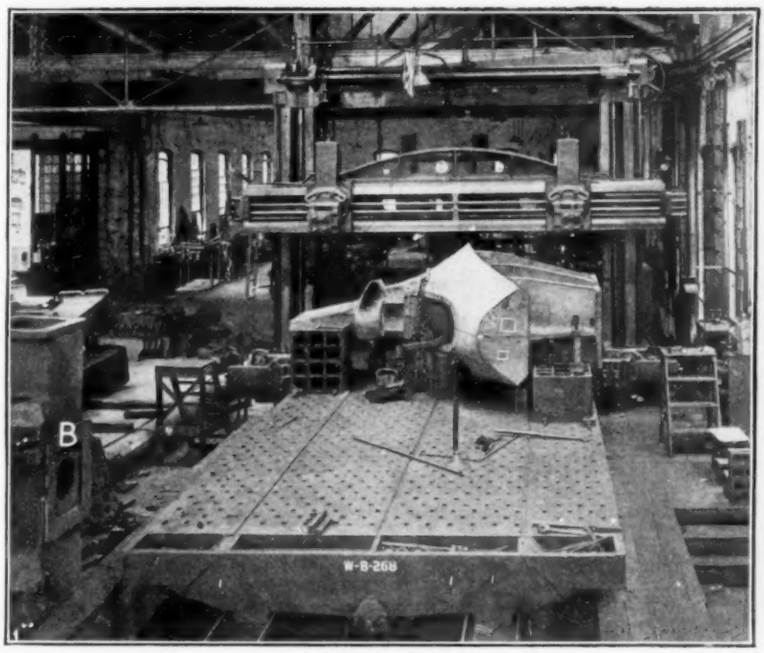



FIG. 1. LARGE SELLERS' PLANING MACHINE AT WORK ON SHIP'S STERNPOST

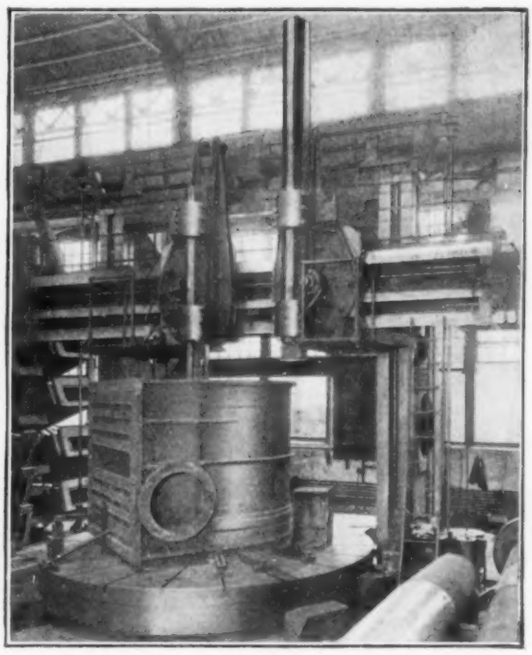


FIG. 2. BORING MARINE-ENGINE CYLINDER

The six columns for an engine are all set up together on the planing machine to have the guide faces planed. They are then strapped down with these finished surfaces next to the table, but the guides are at right angles to the travel of the latter. When in this position tools in each of the side heads on the planing-machine housings finish the tops and bottoms of the six columns not only square with the guide and parallel with each other, but to exactly the same length. Anyone can appreciate what this means who has set up engines in shops where the machines were not only too small for the work but never could be relied on to produce flat or square work.

The same course is pursued with all duplicate planing-machine work, and wherever it is possible all similar parts for an engine are machined in multiple.

In Fig. 2 is shown a low-pressure cylinder being bored on a Niles-Bement-Pond boring mill. This is an exceptionally heavy mill for its size, being in reality a 20-ft. mill with the housings brought in so the table will swing only 14 ft. in diameter by 10 ft. in height.

The first job on a cylinder of this kind is to take a light roughing cut through the bore to see if the casting is sound. The job is then turned over and the feet faced off, after which it is again turned over and the bore and top flange finished.

Cylinders of this size are often bored and faced on a horizontal machine fitted with boring bar and head and turning heads. Heretofore mechanics have been prejudiced against the vertical type of boring mill for this work, their contention being that it is not so accurate as the horizontal machine. Having seen the work from this machine and the records of gagings of the bore, which showed the cylinders to be truly cylindrical to 0.003 in., I am inclined to believe that few horizontal machines with the sag of a heavy boring bar to contend with would show any better or even as good results.

So far we have the seats on the bed for the column in a true plane; we have the columns all exactly equal in length and their ends true parallel planes; and the cylinder bored while bolted to a true platen in exactly the same position it will occupy on top of the finished columns in the completed engine. With these conditions it is difficult to see how the parts could be assembled out of line.

In Fig. 3 a large Sellers' horizontal boring, drilling and milling machine is shown being made ready to mill the pads on the side of the column *A*. The column is bolted with the face of the guide on the parallels *B*. These rest on the table *C*, which is provided with a circular base divided to degrees. The degree marks are

approximately ¼ in. apart, so angular settings for faces such as these pads can be easily approximated to less than 15 min. of arc.

In Fig. 4 is shown the set-up on a Dietrich & Harvey horizontal boring, drilling and milling machine for drilling the stud holes in propeller blades. These holes are oval in shape, so that should there be errors in the blade castings or the drilling of the holes for the studs each blade can be set independently on the propeller hub to the desired pitch.

This illustration also gives an idea of the great size of the machine-tool accessories used in this work. At *A* is a large-webbed parallel block approximately 5 x 6 ft. At *B* are a pair of V-blocks.

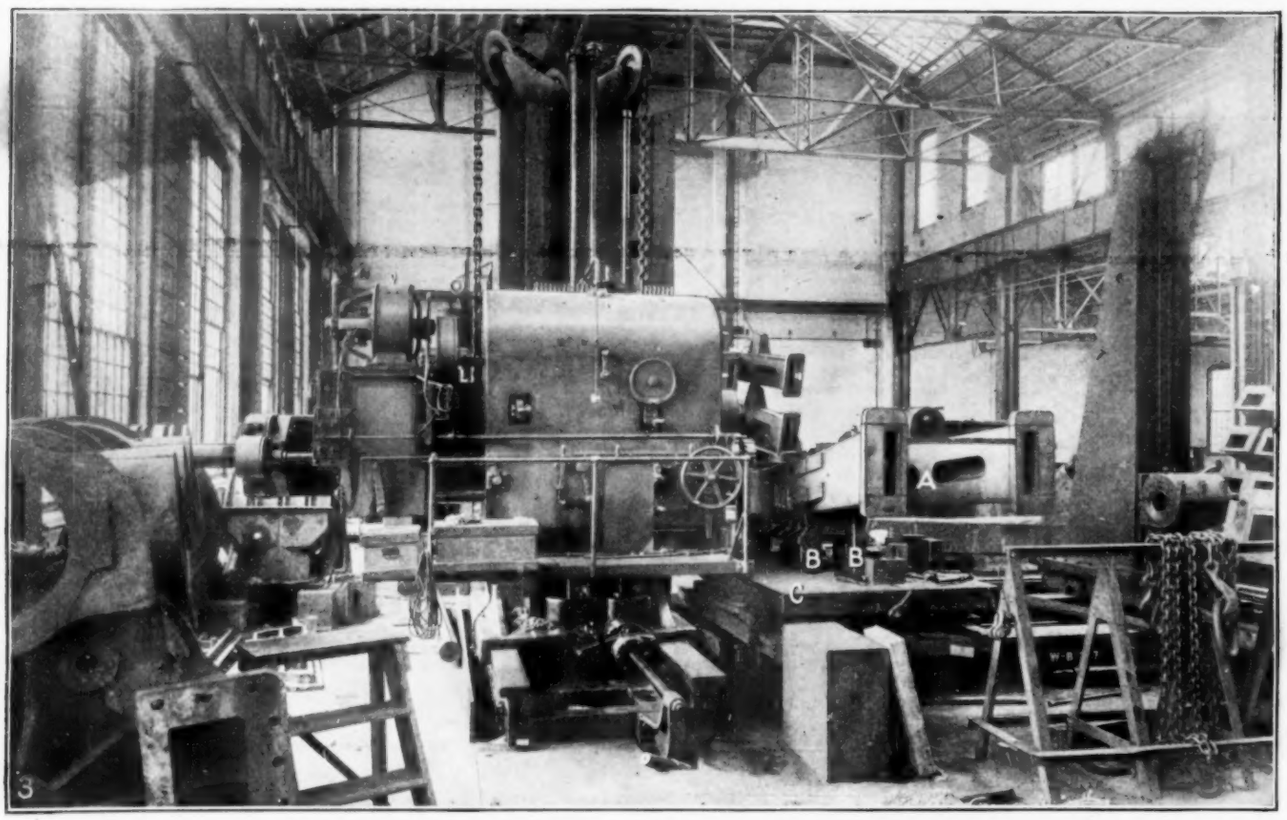
In Fig. 5 is shown a Pond lathe with a thrust shaft that is just about finished. The body diameter of the shaft is about 15 in.

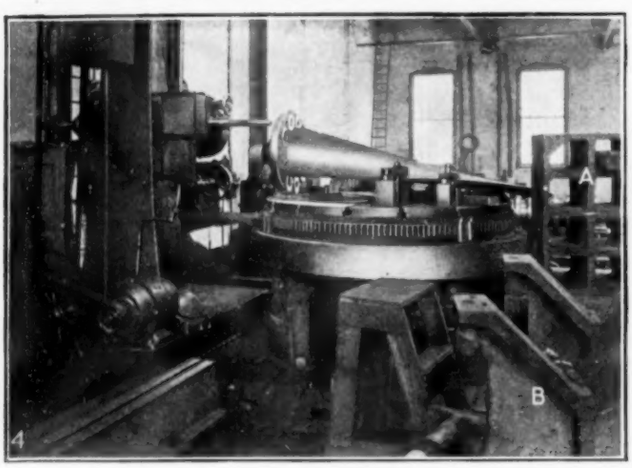
The heavy machine-tool equipment at the Wetherill plant of the Sun Shipbuilding Co. is practically all new, the supervision is by skilled men and the mechanics who run the tools know how to do good work, so while there is no intention to belittle the work of the 15 men who assembled those two 3000-hp. engines in 30½ hours, I would call attention to the fact that they had unusually accurate parts to assemble.

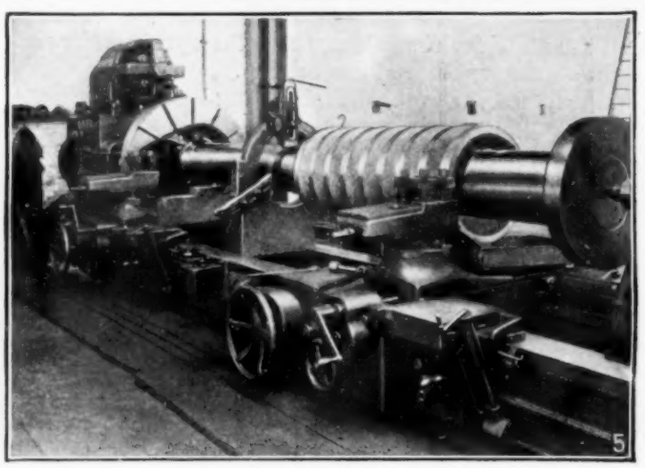
## What's in a Name?

BY L. L. THWING

I note that an old and well-established machine-tool manufacturer has put on the market a "cherrying attachment," and I have searched the Condensed Clipping Index for a picture of this mechanism, but so




FIGS. 3 TO 5. MACHINE OPERATIONS ON ENGINE PARTS
Fig. 3—Milling pads on marine-engine columns. Fig. 4—Boring stud holes in propeller-blade flange.
Fig. 5—Turning a thrust shaft

far unsuccessfully. Doubtless I shall discover in due time that this has no connection with the final operation in the fabrication of a cocktail, but is probably a name, new to me, for a well-known device.

In looking over a list of machine tools recently, I came across the item: 1 screw chaser, listed as part of the equipment of an engine lathe, and assumed it to refer to some sort of thread-cutting attachment, but investigation proved it to be a machinist's name for a small faceplate. He said: "It is something to chase the dog around, and it isn't a faceplate at all, because a faceplate has a lot of slots in it for bolts, so that a piece of work can be strapped to it." A canvas of all the lathe catalogs at hand showed that all manufacturers but one call it a "small faceplate." The one exception called it a driving plate, which seems to be more accurately descriptive, if not so common.

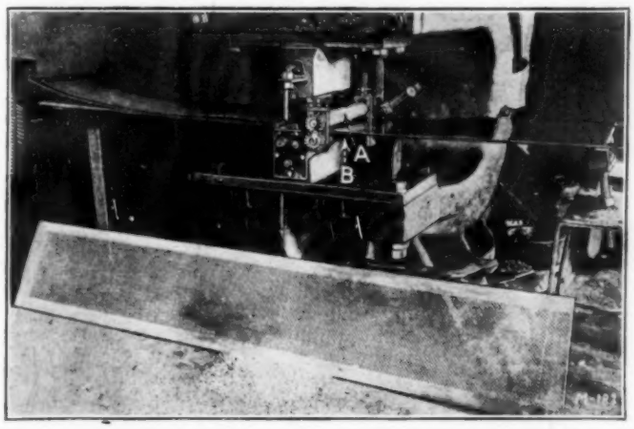
I have always thought that the words "geared head," when used as descriptive of a machine tool, indicated that the machine was a single-pulley drive with all gear speed changes, but I have before me a circular of a "geared-head screw machine" with a three-step cone, and what I should call a friction back-geared head.

Other questions that have come up for discussion are the difference, if any, between index centers and dividing heads; spiral and helical gears; double and triple back gears; collets and split checks; vises and chucks.

## Perforating Plates in a Railway Shop*

By J. J Sheehan

The device shown in the illustration is in use in the Roanoke shops of the Norfolk & Western Railway, and is for perforating the plates used in connection with the grease cellars in driving boxes. The largest plates perforated are 15½ in. wide, and can be made any convenient length, the standard length used here being 8 feet.




PUNCHING DEVICE FOR MAKING PERFORATED PLATES

For punching, the sheets are placed on a guideway and entered between the feed rolls *A* and *B*, which control the movement of the sheet into the punch at each opening stroke. After starting the operation, the sheet is automatically fed the proper amount by each successive stroke of the punch.

There are four rows of ¼-in. punches, each row containing 25, so that a total of 100 holes are punched at each stroke of the machine. The punches are staggered as to length, so as to break up the force of the blow. The die is a solid steel plate in which holes have been drilled, reamed and counterbored, for relief on the bottom side, to suit the position of the punches. With this device, one man handles the work without aid, and gets out the plates at the rate of about 10 per hour, making a cost to us of approximately 6 cents per plate. One of the plates upon which the punching has been finished is shown at the base of the punch press.

*From paper presented at the annual meeting of the American Railway Tool Foremen's Association in Chicago.

## In Retrospect

By W. D. Forbes

The suggestion made by Matthew Harris in his interesting article, page 1259, Vol. 50, of *American Machinist*, in which he suggests recording the origin of various processes, machines and tools, is one that I think should be acted on, and no other journal is so well fitted to further the effective carrying out of this idea as the *American Machinist*.

Time rolls on and what many know today will be lost by not having it recorded now, and the real facts of today will become the traditions of tomorrow. I did something in this direction by recording the history of the first micrometers. I set it down when I heard it from the lips of the four men who were instrumental in making the micrometer a practical tool.

The blueprint history I can shed only a little light on. In the year 1876 I first saw the process described in a French publication and the first print I saw was three years later while I was employed by John T. Noye of Buffalo, New York. Richard Noye showed me a print that had been sent out, either by the Gleason Co. of Rochester, or by the Tabor Indicator Co. From one or the other of these companies, Mr. Noye got the formula for the solution used and I had it made up, and for some time I made blueprints for the works and was looked upon as a person of great moment; but today I would be only a blueprint boy of no moment at all. No one knows, it would seem, the exact history of this very useful process, and now is a good time to speak up lest it be lost forever.

As to wrenches, the Baxter wrench I well remember, as I used it in all sizes, and I believe it would sell very well today if again put on the market. It was neither well made nor of good material; yet it was a most convenient tool.

Regarding the monkey wrench, I can give the following account, but what I say illustrates the necessity of recording facts and not leaving us with mere traditions as, so far as I can find out, is the case as to the origin of that tool.

For several years I went often to Bordentown, N. J., and as I had always heard that a man by the name of Monkey living in that historic old town had made the first wrench with a screw-moved jaw, I began to inquire of the older residents as to the facts.

Mr. Woodward, a gentleman who stood very high in the town, told me that he had often been told by old employees of the Camden and Amboy Railroad that the first monkey wrench was made in the shops of that road in Bordentown, not by a man named Monkey, but one of some other name which he could not remember; and that the wrench was given the name of monkey, as it looked something like that animal, and the man who

made it was given the nick name of "Monkey" by his fellow workmen.

George Runton, who was for years the master carpenter of the Hoboken Ferry Co., gave me the following history which he got from his father (a stair builder working in the Bordentown shops from their erection up to the outbreak of the Civil War). "The first monkey wrench was made in the shop by a young man, the son of an English coach builder, who came from Burlington, a town just below Bordentown. The young man left the trade of his father and went into the shops to learn the machinist's trade so he could become an engine driver on the road. He had worked at the forge quite a little and was very skillful. During the noon hours he worked away at something without saying anything to his mates, who were very curious as to what he was working at. Finally the thing was finished and the first monkey wrench was shown to the men."

Now, why monkey wrench? According to Mr. Runton, the maker of the wrench was asked where he got the idea and in answer he went to a drawer and took from it a wooden nut cracker which his father had brought from England. It was made in the form of a monkey, the lower jaw being hinged, and a screw forced the jaw up against the nut to be cracked, so the wrench was dubbed its present name.

All this is legendary; none of it is capable of proof so far as I know, and it is just here that the *American Machinist* can do great work, as among its readers there must be some one who can add to the account given, or, perhaps, demolish it entirely by facts that can be proved.

To my mind the story as I got it from Mr. Runton seems plausible, as I have very often seen nut crackers in England made in the form of monkeys, and I know that Burlington was a place where carriages were made and that a number of English families came there to build coaches. I know also that the shops of the Camden and Amboy R.R. produced many articles that have become known all over the country.

Now, here is something which is direct as to the origin of the differential pulley block, and certainly that very useful appliance is worthy of being remembered and recorded.

The inventor of the differential pulley block was T. A. Weston, an Englishman by birth, and he told me the following as to its origin:

"I was employed as a clerk in the hardware store of Pratt & Letchworth, Buffalo, N. Y. I opened boxes, sold goods and did all kinds of work, and in handling the heavy boxes I got to th..king how convenient it would be if the rope hoists would not 'overhaul.' I made several attempts to fit a brake to the ropes or falls but I did nothing at all that was practical. Then I thought I would try to use a chain, as with it the links would form stops for the pawl I was trying to use. When I got the idea of sprockets I felt sure that at last I had something good, though I am not at all sure how I reasoned out my main idea of the differential principle.

"After I had made my first model I took it down to the store and put it into a drawer, intending to show it to my fellow clerks.

"It was some days before I showed it; but one stormy winter day kept customers away from the store, so I took out my model to exhibit it. It awakened much interest, but all who saw it declared that the spikes of the sprockets, which entered the links of the open chain, would break off. At this I said I could do away with them, but all seemed to think this impossible, and I was quite provoked over the doubt thrown on my ability to do what I said I could do. That storm and discussion established the date for my patent claim as the inventor of the block, as it was easy to fix the date of the storm, and the discussion was remembered by all who saw the model. It was only a short time after that I made the block with a close chain, the links of which were sunk into the face of the sheaves.

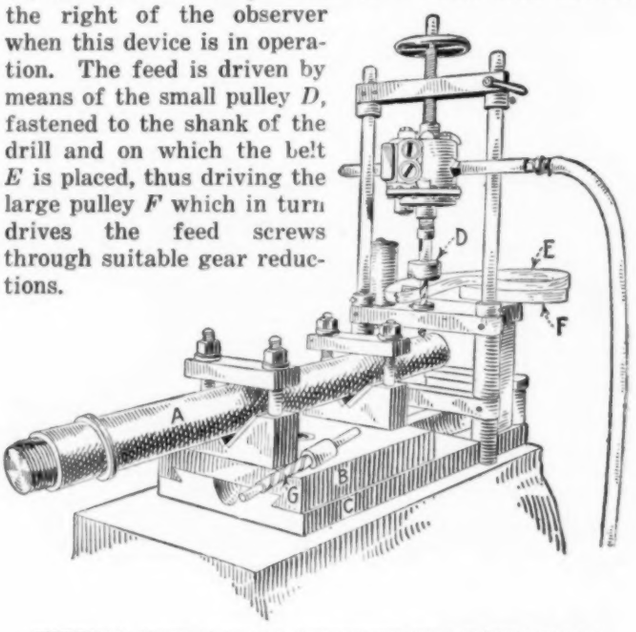
"Within one or two months of the issuance of my first patent, three firms began to infringe and I fought them for years before I established my title."

A book on the origin of mechanical things would be of value.

## Device for Cutting Keyways in Locomotive Piston Rods*

By E. J. McKernan

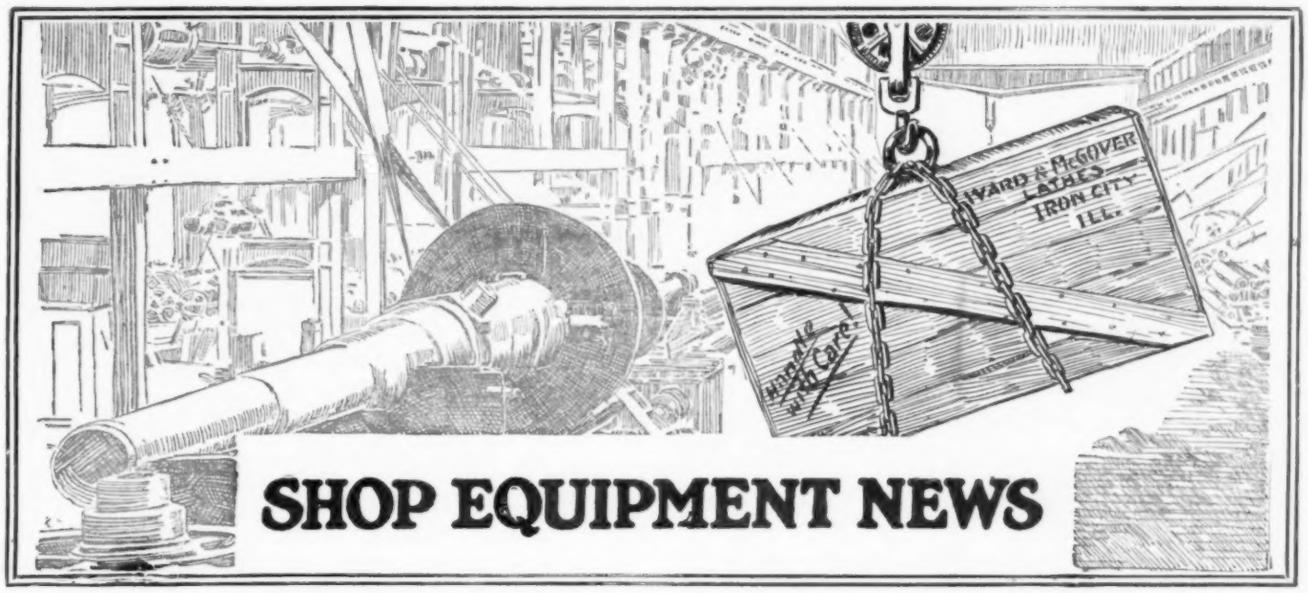
The illustration shows a device used in connection with an air motor for drilling or cutting keyways in locomotive piston rods, also the first operation that is necessary in connection with this work, which is drilling the end hole of the standard size of the keyway. The piston rod *A* is clamped in the V-blocks mounted on the movable table *B*, which rests on the main base *C*; the table is driven by means of a screw feed toward the right of the observer when this device is in operation. The feed is driven by means of the small pulley *D*, fastened to the shank of the drill and on which the belt *E* is placed, thus driving the large pulley *F* which in turn drives the feed screws through suitable gear reductions.




CUTTING KEYWAYS IN LOCOMOTIVE PISTON RODS

After drilling a hole completely through the piston rod, the twist drill is removed, and the helical cutter *G* is inserted through the hole, and the longitudinal feed started, thus feeding the piston rod continually against the helical cutter. The piston rod is clamped at an angle so that the cutter will leave the end of the keyway the proper taper for the key to butt against. A frame is provided for supporting the air motor and is furnished with a long feed screw so that the drill may be fed through the large diameter of the piston rod.

*From paper presented at the Chicago meeting of the Railway Tool Foremen's Association.

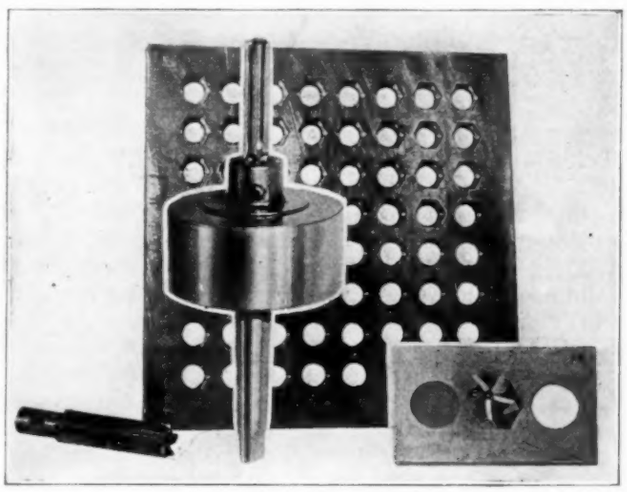



# SHOP EQUIPMENT NEWS

## Watts Square- or Hexagon-Hole Drilling Device

The Watts Bros. Tool Works, Turtle Creek, Penn., has placed on the market an arrangement for making square or angular holes. The equipment as shown consists essentially of three parts, a floating type chuck, a special drill and a guide plate.

The equipment is intended for use in any ordinary drilling machine or lathe and is recommended for work



WATTS SQUARE- OR HEXAGON-HOLE DRILLING DEVICE

that cannot be broached, such as socket wrenches, collets, feed fingers for automatic screw machines, etc.

The tool or drill is an end cutter and works in a similar manner to an end mill. The guide plate is clamped to the work and acts as a jig, the floating chuck simply permitting the necessary lateral motion of the tool when cutting.

In operation a round hole is first drilled leaving as little stock as possible for the special tool to remove as shown by the large plate in the illustration. The small plate shows the guide with the tool in the guide hole. The holes on each side are bolt holes to clamp the guide plate to the holder or jig.

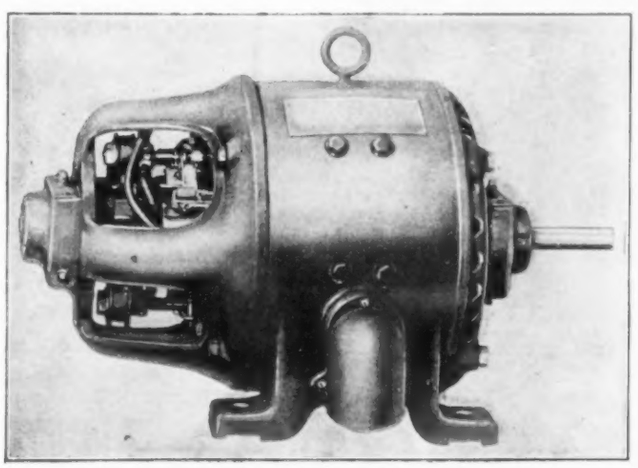
The device is not recommended for deep holes and is limited to depths of two and a half to three times the diameter of the hole. It is furnished in four sizes with capacities ranging from ¼- to 1½-in. holes. The guide plates are ordinarily made in round shapes but can be furnished in special sizes and shapes for jigs. The chucks can be used on other work when not being used for angular holes.

## Allis-Chalmers Direct-Current Motors

The Allis-Chalmers Manufacturing Co., Milwaukee, Wis., has introduced a line of commutating-pole direct-current motors that are rugged and compact in appearance, as shown by the illustration, and are said to have excellent operating characteristics.

The ratings and speeds of the constant-speed motors are identical to those of 60-cycle induction motors and they can accordingly be used interchangeably with induction motors without affecting gear ratios, method of drive, etc. The adjustable-speed motors have a speed range of two to one, three to one, or four to one, which should meet all requirements for machine-tool application. The line of ratings now complete covers motors from ½ to 50 hp. and are furnished as open type, semi-inclosed or totally inclosed as required.

Cast-steel yokes, combining light weight and rigid



ALLIS-CHALMERS DIRECT-CURRENT MOTOR

construction, are used for the larger ratings while the smaller machines which are of the bi-polar type have riveted frames. This line which is designated as the Allis-Chalmers type E is claimed to be completely new throughout, no attempt having been made to redesign old apparatus or to employ parts from any previous machines.

## The Liberty Portable Drilling and Countersinking Presses

The Liberty Tool Co., Munsey Building, Baltimore, Md., has put on the market the two portable drilling and countersinking presses shown in the illustrations for use in connection with air-drill work. The device shown in Fig. 1 is designed to fit any make or shape of pneumatic drill, and is equipped with a $2\frac{3}{4}$-in. air cylinder at its base, which is used for a pneumatic feed. The device has a sliding head so that any work may be taken from $\frac{1}{2}$ to 14 in. in thickness, and is built with a view of taking care of drilling holes from $\frac{1}{2}$ to $1\frac{5}{16}$ in. in diameter, and countersinking up to 2 in. This device performs all the functions of a portable drill press, and its pneumatic feed is especially serviceable when this machine is used in drilling and countersinking work on flange and plate work and such parts as fire-doors, flue sheets, door sheets, fireboxes, ship plates, etc.

The double-cylinder air-feed device shown in Fig. 2

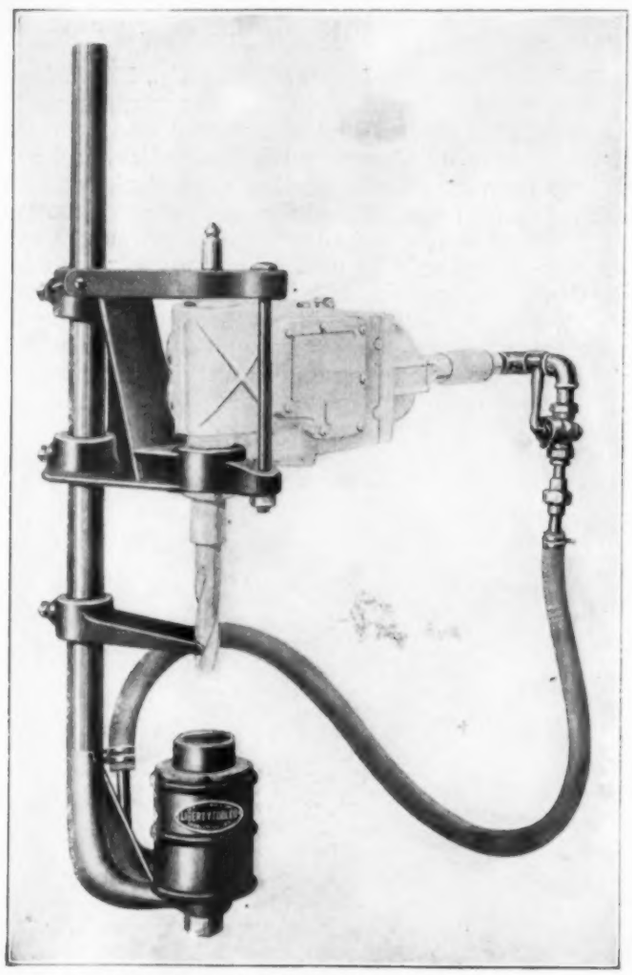


FIG. 1. LIBERTY PORTABLE DRILLING PRESS WITH PNEUMATIC FEED BASE

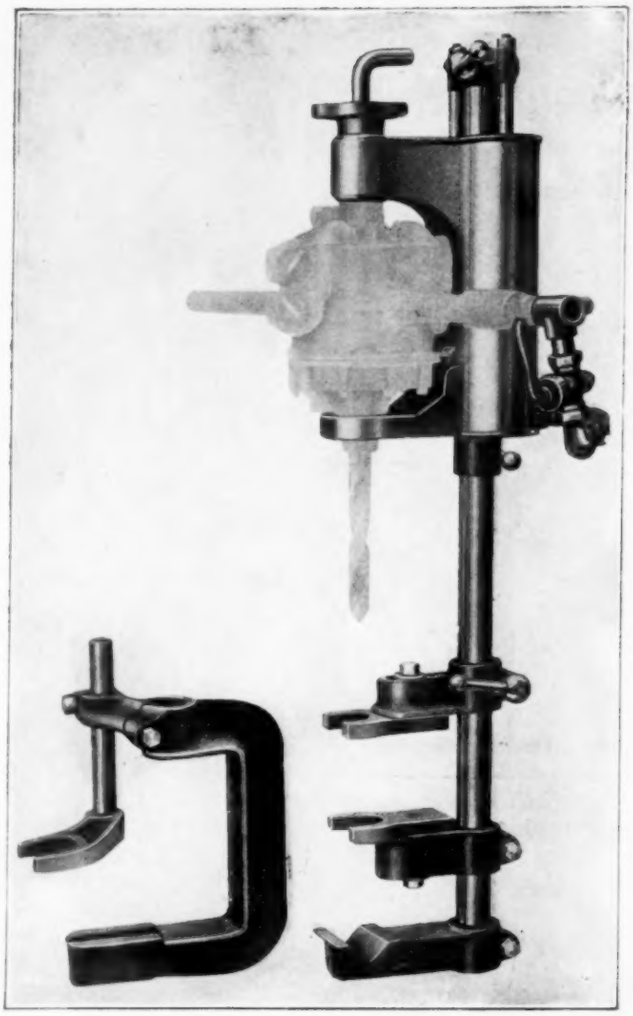
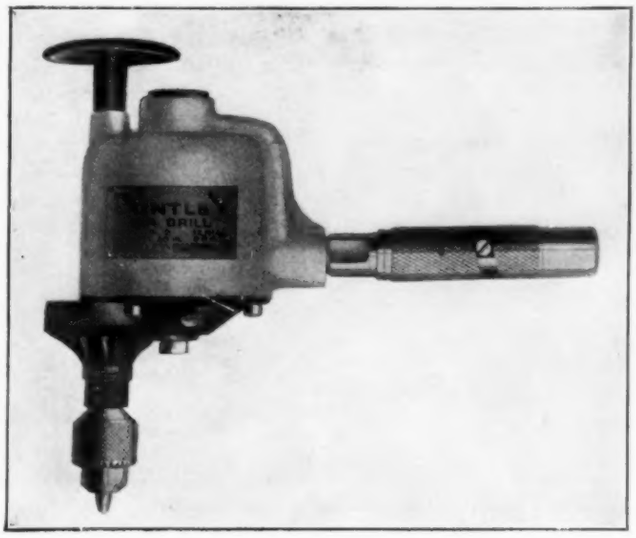


FIG. 2. LIBERTY PORTABLE DRILLING PRESS WITH DOUBLE-CYLINDER PNEUMATIC FEED

is a still further development of this same scheme, but the air cylinder at the base has been replaced by the clamping device shown, and the device is equipped with a sliding head and also a sliding table. The head has a double-cylinder pneumatic-feed arrangement with a travel of pneumatic feed of 8 in., and will take work up to $\frac{5}{16}$ in. for drilling, and 2 in. for countersinking. Like the first device mentioned, it is designed to fit any make or shape of pneumatic drill. The air in the pneumatic feed cylinders is released by a three-way cock conveniently located to the handle of the pneumatic drill, so that the operator can handle both air supplies without effort. The depth of feed of the cylinders may also be regulated by means of a collar, which is adjustable for any depth within the length of travel of the cylinders.

## Duntley-Davton Air Drill

The Duntley-Dayton Co., 1416 Michigan Ave., Chicago, has placed on the market a multiple-cylinder air drill. This tool shown in the illustration is said to have many advantages. The motor is of the rotating-cylinder type and has three cylinders. The pistons are of large diameter and have a short stroke suitable for high speed. The valve motion is governed by cams on the stationary crankshaft or axis about which the cylinders revolve.



DUNTLEY-DAYTON AIR DRILL

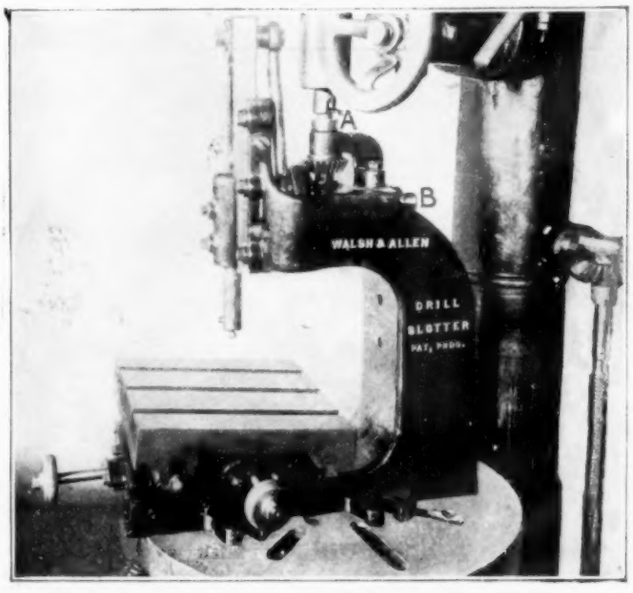
All working parts run in a bath of oil, and a ball bearing is provided for the thrust.

The motor can be readily taken out for inspection or adjustment by simply removing the case cover. The motors are interchangeable and are said to run at high speed with very little vibration. The tool is built in two sizes, No. 00 with a capacity of ¼-in. drills and No. 0 for ⅜-in. drills, and is recommended for drilling test holes in stay bolts and other work of such character.

## Walsh & Allen Slotting Attachment

The illustration shows a slotting attachment which is made by Walsh & Allen, Wilbur Ave., Brooklyn, N. Y., it being mounted on the table of a drilling machine. Power is derived from the drilling-machine spindle through an ordinary drill socket at *A* and an abundant range of speeds is thus obtained suitable for almost any class of work.

However, the attachment can be used on any suitable machine having a horizontal spindle, in which case connection for the drive may be made at *B*.

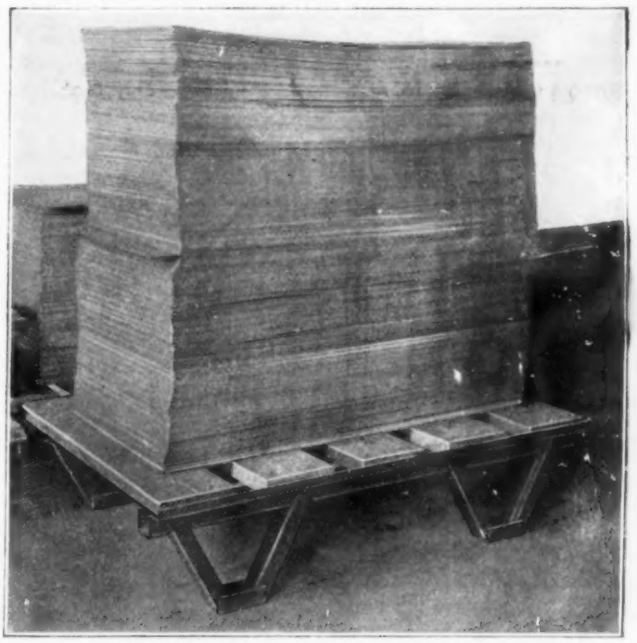



WALSH & ALLEN SLOTTING ATTACHMENT

The maximum stroke is 4½ in. with ample adjustment of the ram. The table is 11 x 12 in. and can be fed 5 in. by hand in either direction. It is hinged at the rear and can be tilted 15 deg. so that taper keyways, etc., can be cut. The cutter bar is 1 in. in diameter and ordinary square toolbits are used for cutters. Different cutter bars can be made to suit any kind of work at small expense. The attachment weighs 175 pounds.

## Lyon Steel Skid-Legs for Elevating-Truck Platforms

The Lyon Manufacturing Co., Aurora, Ill., is manufacturing elevating-truck platforms designed to withstand heavy strains. The skid-legs consist of two welded feet that are in turn welded to a steel channel. The feet have round corners and ample bearing surface for the purpose of saving floors, and the channels



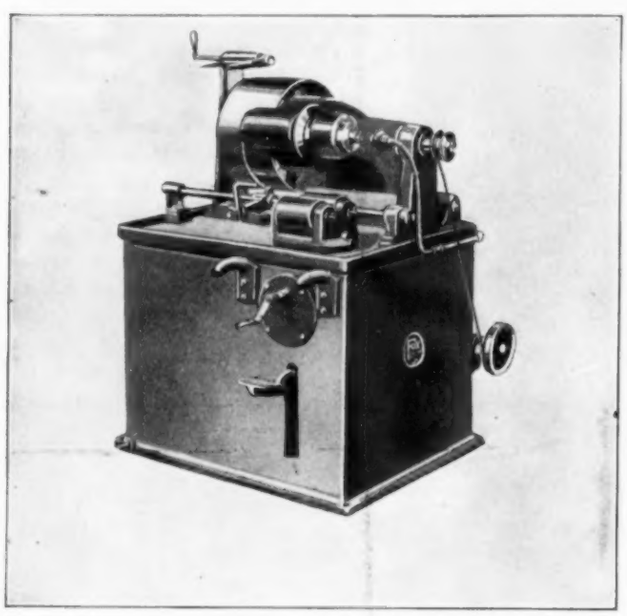
LYON STEEL SKID-LEGS FOR ELEVATING-TRUCK PLATFORMS

are punched to a standard pattern so that extra tops of wood or steel can be carried in stock for replacement. The platforms can be made in any practicable width. The cut shows one of these platforms supporting a load of seven tons, or a load greatly beyond the capacity of the truck to handle, which is for the purpose of demonstrating its strength.

## Fox Pipe-Cutting Machine

The pipe-cutting machine shown is manufactured by the Fox Machine Co., 1804 West Ganson St., Jackson, Mich., and is known as its No. 10 pipe cutter. The machine was designed to meet the demand for increased production and operates on the power-driven revolving-cutter principle. In operation the pipe rests on broad rollers, having Hyatt roller bearings, and the disk cutter is brought into cutting contact with the pipe by means of the foot lever. Pressure applied to this lever will force the revolving disk through the wall of the rolling pipe. The stop gage on the machine table for gaging

the lengths to be cut is adjustable to any length up to 22 in. The position of the cutter can be regulated up or down to suit the size of pipe, by turning a crank handle which extends through the front of the machine. Three different sets of pipe rollers are furnished with each machine, that will accommodate all sizes of pipe from ⅛ in. to 6 in. The two larger-sized sets have rollers mounted on Hyatt bearings, but the smaller size has plain bearings. A pipe-supporting stand is furnished, having an indexing carrier that holds three sets of rollers. When shifted into place, these keep the various sizes of pipe in alignment and correct position. A motor-driven cutter-grinding attachment is furnished with each machine adaptable to either alternating or direct current at 110 volts. The cabinet base of the machine is flanged at the top to catch the cutting compound, which is circulated by means of a force pump. As to structural features, the foot lever



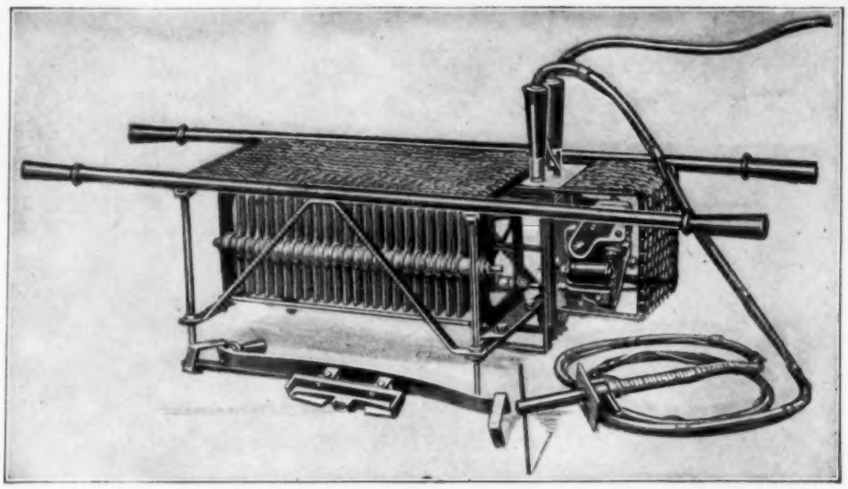
FOX PIPE-CUTTING MACHINE

Specifications: Floor space, 22 x 38 in.; height of table, 28 in.; size of tight and loose pulleys, 14 x 4 in.; pulley speed, 300 r.p.m.; cutter shaft speed, 100 r.p.m.; cutter disk diameter, 6 in.; net weight, 1500 lb.; domestic shipping weight, 1800 lb.; export shipping weight, 2300 lb.; cubic contents, 52 cu.ft.; for motor drives, allow 150 lb. additional.

is compounded to a leverage of 20 to 1, and the disk cutter is supported at both sides. The cutter arm is provided with Hyatt high-duty bearings and is readily removable. The gears, which are incased, are machined, hardened and heat-treated. Where motor drive is required a 2-hp. General Electric motor is furnished for either alternating or direct current, 110 or 220 volts.

## Ohio Portable Arc-Welding Machine

The portable arc-welding machine illustrated herewith is a product of the Ohio Brass Co., Mansfield, Ohio. It was designed primarily for welding rail bonds and intended particularly for use in mines, where space is at a premium. However, it has been found useful as a shop tool, owing to the fact that it can be easily carried by two men to the place where needed.



OHIO PORTABLE ARC-WELDING MACHINE

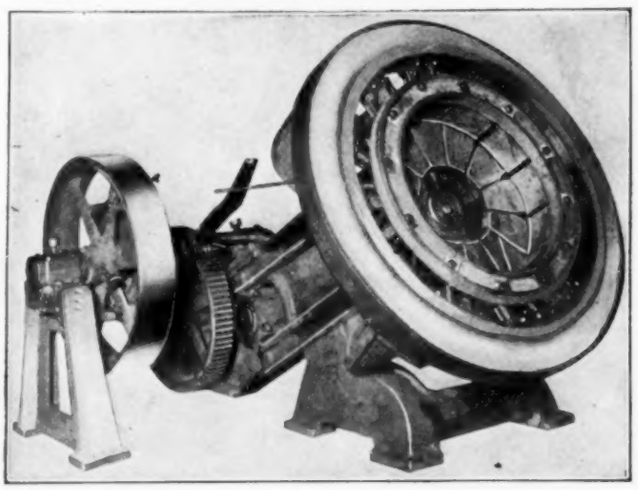
The machine is of simple, durable construction, cast grids furnishing the resistance, and a circuit-breaker and remote control switch are provided for the convenience and safety of the operator. The remote control switch is located on the holder and is thus available for instant use when starting or stopping the current.

## Grotnes Tire-Rim Upsetting Machine

The method most commonly used by manufacturers in the welding of tire rims has been to weld the rim with the diameter less than the size required, and afterward expand the rim, while cold, to the correct diameter, this procedure being due to the difficulties experienced in welding the rims to a uniform size.

To expand the rims after welding, a tire-expanding machine was used. The expanding operation, however, required the use of a low-carbon steel for the rims, as high-carbon steel is more likely to break during the stretching process, but can be upset with no danger of breaking or straining the metal.

For the purpose of using the upsetting principle to get the correct diameter, the Charles Grotnes Machine



GROTNES TIRE-RIM UPSETTING MACHINE

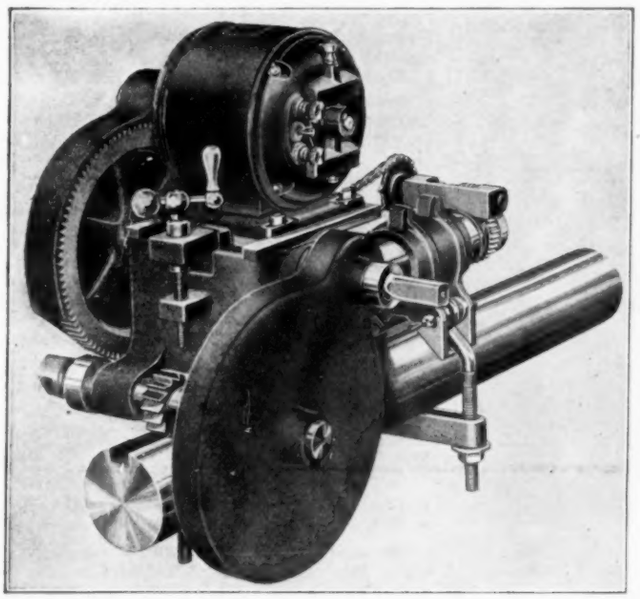
Specifications: Floor space, 91 x 72 in.; height, 67 in.; pulley, 36 x 6 in.; maximum stroke, each jaw, 1⅝ in.; strokes per minute, 8; net weight, 9500 lb.

Works, 128 North Jefferson St., Chicago, has developed a machine for upsetting or contracting a tire rim to the correct size instead of expanding it. This machine, as shown by the illustration, differs from the regular tire-setting type in that it is power driven instead of hydraulic, and the rim is held nearly vertical instead of horizontally while being contracted. The jaws or dies are controlled by a toggle motion and have a combined movement of 3¼ in. across the diameter of the circle.

A friction clutch is provided, but the machine in operation runs continuously, making eight strokes per minute, which means a capacity of eight rims per minute. A wedge adjustment operated by means of a handwheel is provided to take up wear, or otherwise adjusted to suit the conditions.

## Bucher-Smith Keyseating Machine

The Bucher-Smith Co., East Liverpool, Ohio, is now manufacturing a portable motor-driven keyseating machine, in addition to its Style A hand-power machine. The machine shown is known as style A-2, and has a spur-gear drive. The sliding head is cast solid to the spindle; the feed screw, being inside the spindle, keeps the pulling strain close to the shaft. A power feed is

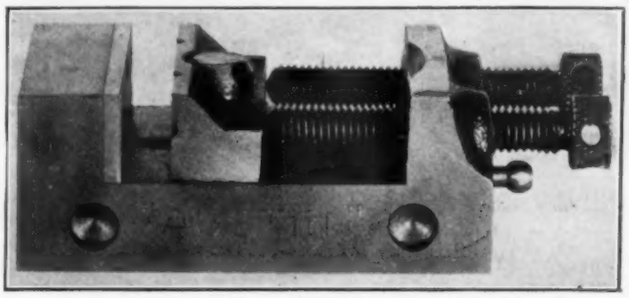


BUCHER-SMITH PORTABLE ELECTRIC KEYSEATER

furnished by a sprocket-chain connnection from the main shaft to worm gearing on the screw. The depth of cut is regulated by the vertical screw shown above the cutter. The main shaft is squared on the end for a wrench, thus permitting hand-power operation if current is not available. The motor furnished is either alternating-current or direct-current and the power connection is usually the nearest lamp socket. The machine will cut keyways from ¼ to 1¼ in. wide by 12 in. long, and is suitable for shafts from 1¼ to 5 in. in diameter.

## Austin Toolmaker's Vise

The Austin Tool and Machine Co., Inc., Pittsburgh, Penn., has brought out a vise which is a very handy tool for the toolmaker; also for instrument and model making. The body is designed to withstand a great



AUSTIN TOOLMAKER'S VISE

strain, is finished square on five sides, and is fitted with a hardened and ground detachable jaw face, which is held by two screws. The movable swivel jaw is held down by a screw in the center, and has three V-grooves in the face for gripping round pieces either in the vertical or horizontal position. Two knurled screws are used to tighten against the swivel jaw, which is the best method for holding parallel or tapering pieces. A pin is provided to tighten the screws, and is placed in a hole in the body of the vise when not in use. The two holes on either side may be used to clamp the vise to the table of a grinding, milling or drilling machine; it weighs only 20 oz., making a compact and self-contained tool.

The jaws are 2 in. long and ⅝ in. deep and will hold round stock up to 1 in. in diameter.

## Standard Classification of Extras on Cold-Finished Steel and Shafting

(ADOPTED AUG. 18, 1919)

NET EXTRAS FOR SIZE (Extras are per 100 lb. net)

ROUNDS

| (Prices given are per 100 lb.) Thickness in Inches: | | | (Prices given are per 100 lb.) Thickness in Inches: | | |
|---|---|---|---|---|---|
| ¼ | to 5/16 | $2.25 | 3 1/16 | to 3 1/8 | $0.25 |
| 5/16 | to 7/16 | 1.50 | 3⅛ | to 3 3/16 | .50 |
| 7/16 | to ½ | .90 | 4 | to 4 1/16 | .80 |
| ½ | to 9/16 | .60 | 4⅛ | to 4 3/16 | .90 |
| 9/16 | to ¾ | .40 | 5 | to 5 1/16 | 1.00 |
| ¾ | to 1 1/16 | .30 | 5⅛ | to 5 3/16 | 1.50 |
| 1 1/16 | to 1 7/16 | .25 | 6 | to 6 1/16 | 2.00 |
| 1⅛ | to 2 15/16 | .15 | 6⅛ | to 7 | 2.50 |
| 2 1/16 | to 3 | Base | | | |

FLATS

(Prices given are per 100 lb.)

| Thickness in Inches | | ¼ in. | ⅜ in. to ½ in. | 9/16 in. to ¾ in. | ¾ in. to 1 in. | 1⅛ in. to 1½ in. | 1 9/16 in. to 3 in. | Wider than 3 in. |
|---|---|---|---|---|---|---|---|---|
| ¼ | to 5/16 | $8.50 | $6.50 | $5.50 | $4.50 | $3.50 | $2.50 | $2.50 |
| 5/16 | to 7/16 | 7.50 | 5.50 | 5.00 | 3.50 | 2.50 | 1.50 | 2.50 |
| 7/16 | to ½ | .... | 4.50 | 4.00 | 2.50 | 2.50 | 1.50 | 2.50 |
| ½ | to 9/16 | .... | .... | 3.00 | 1.50 | 1.50 | 1.25 | 2.50 |
| 9/16 | to ¾ | .... | .... | 2.50 | 1.25 | 1.25 | 1.25 | 2.50 |
| ¾ | to 1 1/16 | .... | .... | .... | 1.25 | 1.25 | 1.25 | 2.50 |
| 1 | to 1⅛ | .... | .... | .... | .... | 1.25 | 1.25 | 2.50 |
| 1⅛ | to 1 3/16 | .... | .... | .... | .... | .... | 1.25 | 2.50 |
| 1 3/16 | to 1⅜ | .... | .... | .... | .... | .... | 1.25 | 2.50 |
| 2 | to 2 1/16 | .... | .... | .... | .... | .... | 1.25 | 2.50 |

SQUARES AND HEXAGONS

| Thickness in Inches: | | Per 100 Lb. |
|---|---|---|
| ¼ | to 5/16 | $3.50 |
| 5/16 | to 7/16 | 3.00 |
| 7/16 | to ½ | 2.00 |
| ½ | to 9/16 | 1.35 |
| 9/16 | to ¾ | 1.00 |
| ¾ | to 1 1/16 | .80 |
| 1 1/16 | to 1 7/16 | .70 |
| 1⅛ | to 2 | .60 |
| 2 1/16 | to 2 15/16 | 1.00 |
| 2⅛ | to 3 | 1.50 |
| 3 1/16 | to 4 | 2.00 |

QUANTITY DIFFERENTIALS

All specifications for less than 2,000 lb. of a size will be subject to the following extras, the total weight of a size ordered to determine the extra, regardless of the exact quantity actually shipped:

| | |
|---|---|
| 1,000 to 1,999 lb. | $0.15 per 100 lb. net |
| Less than 1,000 lb. | .35 per 100 lb. net |

# Sparks from the W

## Railway Commissioners to Hold Convention

The official call for the thirty-first annual convention of the National Association of Railway and Utilities Commissioners, to be held in Indianapolis, Ind., beginning Oct. 14, 1919, has just been issued by Charles E. Elmquist, president; C. M. Candler, chairman of the executive committee; and James B. Walker, secretary of the association. The National Association comprises all of the railroad and public service commissions in the United States, as well as those in Hawaii and the Philippine Islands. There are now 53 different commissions belonging to the association, representing every state in the Union with the exception of Delaware, which is the only state having no regulatory commission.

The convention will meet in the auditorium of the Claypool Hotel in Indianapolis, and the address of welcome will be delivered by E. I. Lewis, chairman of the Public Service Commission of Indiana. The opening address will be delivered by Clyde B. Aitchison, chairman of the Interstate Commerce Commission, and several members of that Commission are expected to be in attendance. Walker D. Hines, director-general of the United States Railroad Administration, has been invited to address the convention.

The sessions of the convention will cover four or five days and, aside from the addresses mentioned, will be devoted mainly to the consideration of reports of standing and special committees. There are 21 of these committees, and their reports will cover all phases of railroad and utility regulation. Among the important subjects to be reported upon are public ownership and operation, safety of operation, service of railroads and service of utility companies, railroad rates and utility rates, demurrage, express companies, grade crossings, statistics and accounts, capitalization, and state and Federal legislation.

* * *

## Opportunity for Farm Machinery in Asia Minor

"Asia Minor is a promising virgin field for agricultural machinery," cables consul-general George Horton of Smyrna. "For the first time in its history tractor machinery will immediately come into general use.

"The country offers unusual opportunities for the introduction of agricultural implements, as large tracts await the plow. Great Britain has an agent already here. A farm of 20,000 acres, on a railroad 17 miles from Smyrna, is owned by an American citizen. Part of this farm could be utilized as an experiment station for tractor and other machinery.

"Tractor implements are being sent to the Saloniki region with instructors to teach natives to operate and repair; this should be done here.

"The Greek government informs me that it is willing to pay for tractor machines sent over for introductory purposes; and also that it will place an order for farm machinery to be used by Turkish and other refugees when they return to their farms. Samples suitable for this soil are desired by the government."

* * *

## A. L. DeLeeuw Heads New Consulting Firm

A. L. DeLeeuw, who is known to many of our readers and to most of the prominent builders of machinery, has established a consulting practice. His specialty will be methods of machine-shop operations with a view of economi-

A. L. DeLEEUW

cal production and the equipping and building of plants. For the past five years Mr. DeLeeuw has been chief engineer of the Singer Manufacturing Co., Elizabethport, N. J., at which plant he had charge of the building for the U. S. Government of gun-carriage recuperators. Previous to this he was chief engineer of the Cincinnati Milling Machine Co., and before this chief engineer of the Niles Tool Works, Hamilton, Ohio.

Mr. DeLeeuw, in addition to being a pioneer in machine-tool development, is the father of the wide-spaced milling cutters. During his connection with the Singer company he designed a great many special automatic machines for various special production purposes.

His headquartes will be Room 219, Singer Building, at 149 Broadway, New York City.

## Safety Congress to Meet in Cleveland on Oct. 1.

The eighth annual Safety Congress will be held at the Hotel Statler, in Cleveland, from October 1 to October 4. The official program, which has just been issued, contains the titles of a great number of addresses which will be delivered by managers and experts employed by the various corporations to decrease the number of accidents and to install safety measures and devices.

Special efforts to diminish the total of accidents in the City of Cleveland will be made by the municipal officials during the time when the congress is in session. They will attempt to surpass the record made last year in St. Louis, when only one fatal accident occurred during the same period.

Cyrus McCormick, Jr., works manager of the International Harvester Co., will deliver an address on "Co-operation and Industrial Progress." "Supervision as a Factor in Accident Prevention" will be the topic of a speech by L. A. DeBlois, of the E. I. DuPont de Nemours & Co. David Van Schaak, president of the National Safety Council, will preside at the opening.

* * *

## Germany Will Have Difficulty in Opposing Export Competition

The belief that Germany would have little difficulty in opposing competition in the export field has been dispelled, according to reports coming from that country. It was thought that because of the low value of the mark, it would be possible to buy more cheaply in Germany than any other country in the world.

German export authorities, it is reported, have decreed that exports to countries in which the mark is at a great discount are subject to a 70 per cent. "valutazuschlag." Thus an article, which in peace times cost 2000 marks, will cost in view of the 170 per cent. increased war cost, 5400 marks, and because of the 70 per cent. ruling cannot be offered abroad for less than 9200 marks.

German exporters have become aroused over this ruling, declaring that the sale of more commodities at lower figures has a distinct value in developing German industry, and at the same time has a more favorable effect upon the value of the German mark.

It is generally understood, according to reports, that large stocks of machinery available in Germany would have been sold abroad if it had not been for this ruling. German manufacturers are reported to claim that American and English manufacturers have obtained customers which otherwise would not have belonged to them.

# World's Industrial Forge

*By E. C. Porter, News Editor*

## Program of the American Foundrymen's Association

**The following is the provisional program of the twenty-fourth annual meeting of the American Foundrymen's Association to be held in Philadelphia, Sept. 29 to Oct. 3, 1919:**

MONDAY, SEPT. 29

10 a.m.—Registration, Philadelphia Commercial Museum.

11 a.m.—Opening of exhibition, Philadelphia Commercial Museum.

TUESDAY, SEPT. 30

10 a.m.—Joint opening session, American Foundrymen's Association and Institute of Metals Division, American Institute of Mining and Metallurgical Engineers, Ballroom, Bellevue-Stratford Hotel.

Address of welcome, by Thomas Devlin, Thomas Devlin Manufacturing Co., Philadelphia.

Response to the address of welcome, by A. O. Backert, president of the American Foundrymen's Association.

Report of secretary-treasurer, American Foundrymen's Association, Inc.

Report of board of directors, American Foundrymen's Association, Inc.

Annual address by A. O. Backert, president American Foundrymen's Association.

"Considerations Affecting Brass Melting in Grey-Iron Shops," by Russell R. Clarke, Eagle Brass Foundry, Seattle, Wash.

"The Weeks' Electric Rotating Furnace as Applied to the Brass Foundry Industry," by F. J. Ryan, American Metallurgical Corp., Philadelphia.

"The Need for Coöperative Research in Alloys," by H. E. Howe, National Research Council, Washington, D. C.

Report of the American Foundrymen's Association committee on foundry costs, by J. Roy Tanner, chairman, Pittsburgh Valve Foundry and Construction Co., Pittsburgh.

"Publicity Work of Foundry Equipment Manufacturers' Association," by Franklin G. Smith, chairman, publicity committee, Foundry Equipment Manufacturers' Association, Cleveland Osborn Manufacturing Co., Cleveland.

Appointment of nominating committee and committee on resolutions.

2 p.m.—Boat ride on the Delaware River, terminating with a visit to the Hog Island Shipyard.

WEDNESDAY, OCT. 1

GENERAL TOPICS

10 a.m.—Professional session, American Foundrymen's Association, Ballroom, Bellevue-Stratford Hotel.

"Audible Signals in Foundries," by Prof. Vladimir Karapetoff, Ithaca, N. Y.

"How to Secure Best Results in Combining Hoisting Apparatus with Molding Machines," by W. C. Briggs, Shepard Electric Crane and Hoisting Co, New York.

"Foundry Sand-Handling Equipment," by H. L. McKinnon, the C. O. Bartlett & Snow Co., Cleveland.

"Concrete Foundry Molding Floors," by H. H. Haley, American Foundry Equipment Co., New York.

"The Care of Foundry Equipment," by G. L. Grimes, Grimes Molding Machine Co., Detroit, Mich.

"Uniform Methods of Cost Accounting," by C. E. Knoeppel, C. E. Knoeppel & Co., New York.

Report of the nominating committee and election of directors of the American Foundrymen's Association, Inc.

STEEL SESSION

10 a.m.—Professional session, American Foundrymen's Association, Clover Room, Bellevue-Stratford Hotel.

"Electric Versus Converter Steel," by John Howe Hall and G. R. Hanks, Taylor-Wharton Iron and Steel Co., High Bridge, N. J.

"Effect of Sulphur in Steel Castings," by Professor A. E. White, University of Michigan, Ann Arbor, Mich.

"Repairing Castings on Transport Northern Pacific," by Arthur F. Braid, Metal and Thermit Corp., New York.

"Comparison of Costs of Electric and Openhearth Furnace Practice," by E. H. Ballard, West Lynn, Mass.

Report of the American Foundrymen's Association Committee on Steel Foundry Standards, by W. A. Janssen, chairman, American Steel Foundries, Chicago.

"Operation of the Acid Electric Furnace," by L. B. Lindemuth, Carney and Lindemuth, New York.

"Values of the Present Methods of Measuring the Temperature of Molten Steel," by F. W. Brooke, Electric Furnace Construction Co., Philadelphia.

ENTERTAINMENT FEATURES

11 a.m.—Automobile trip for the ladies through Fairmount Park to Valley Forge, where luncheon will be served.

2 p.m.—Golf tournament, Whitemarsh Valley Golf Club.

8 p.m.—Theater party for ladies and gentlemen at Keith's.

THURSDAY, OCT. 2

GREY-IRON SESSION

10 a.m.—Professional session, American Foundrymen's Association, Ballroom, Bellevue-Stratford Hotel.

"The Elimination of Strains in Iron Castings," by C. J. Wiltshire, General Electric Co., Schenectady, N. Y.

"The Value of a Scrap Pile," by Henry Traphagen, Toledo Steel Castings Co., Toledo, Ohio.

"The Electric Furnace as an Adjunct to the Cupola," by George K. Elliott, Lunkenheimer Co., Cincinnati.

Report of the American Foundrymen's Association Committee on General Specifications for Grey-Iron Castings, Dr. Richard Moldenke, Watchung, N. J.

"Side-Blow Converter in Iron Foundry," by George P. Fisher, Whiting Foundry Equipment Co., Harvey, Ill.

"The Testing of Clays for Foundry Use," by Homer F. Staley, Bureau of Standards, Washington.

"Cerium in Cast Iron," by Dr. Richard Moldenke, Watchung, N. J.

MALLEABLE SESSION

10 a.m.—Professional session, American Foundrymen's Association, Clover Room, Bellevue-Stratford Hotel.

"Burning Fuel Oil in an Air Furnace," by J. P. Pero, Missouri Malleable Iron Co., E. St. Louis, Ill.

"The Application of Powdered Coal to Malleable Annealing Furnaces," by Charles Longenecker, The Bonnot Co., Pittsburgh.

"Efficient Use of Pulverized Coal in Malleable Foundry Practice," by Milton W. Arrowood, Ground Coal Engineering Co., Chicago.

"Powdered Coal as a Fuel in the Foundry," by H. A. Grindle, Combustion Economy Corp., Chicago.

"Relation Between Machining Qualities of Malleable Castings and Physical Tests," by Edwin K. Smith and William Barr, Wisconsin Malleable Iron Co., Milwaukee.

"The Refining of Cupola Malleable in the Electric Furnace," by A. W. Merrick, General Electric Co., Schenectady, N. Y.

Report of the American Foundrymen's Association Committee on Specifications for Malleable Castings, by Enrique Touceda, chairman, Albany, N. Y.

"Some Needs of the Malleable Iron Industry," by W. P. Putnam, Detroit Testing Laboratory, Detroit.

"A Note on Britain's Experimental Foundry," by G. Ernest Wells, Edgar Allen & Co., Sheffield, England.

"Galvanizing Malleable Castings," by Prof. Enrique Touceda, Albany, N. Y.

"Effects of Annealing Grey- and Malleable-Iron Bars in Copper Oxide Packing," H. E. Diller, *The Foundry*, Cleveland.

INDUSTRIAL RELATIONS SESSION

10 a.m.—Professional session, American Foundrymen's Association, Red Room, Bellevue-Stratford Hotel.

"Training Men for Foundry Work," by C. C. Schoen, U. S. Dept. of Labor, Stamford, Conn.

"Personnel Problems of Modern Industry," by C. D. Dyer Jr., Hunt and Dyer, Philadelphia.

"Industrial Democracy and the Foreman," by John Calder, Business Training Corp., New York.

Report of the American Foundrymen's Association Committee on Safety, Sanitation and Fire Protection, by Victor T. Noonan, U. S. Mutual Liability Insurance Co., Quincy, Mass.

"Vocational Training for Foundry Occupations," by J. C. Wright, Federal Board for Vocational Education, Washington.

ENTERTAINMENT FEATURES

1:30 p.m.—For the ladies, visit to Wanamaker's store, plant of the Curtis Publishing Co., Independence Hall, and other points of interest.

7 p.m.—Annual banquet, Bellevue-Stratford Hotel, followed by dancing.

FRIDAY, OCT. 3

GENERAL TOPICS

10 a.m.—Professional session, American Foundrymen's Association, Ballroom, Bellevue-Stratford Hotel.

"The Economical Control and Handling of Patterns in a Large Foundry," by W. D. Jones, Canton Steel Foundry Co., Canton, O.

"Progress in the Application of Electric Arc Welding," by Robert E. Kinkead, Lincoln Electric Co., Cleveland.

"A New Cutting Gas," by Professor Alfred S. Kinsey, Stevens Institute of Technology, Hoboken, N. J.

"Welding Castings of Different Metals and Different Sections," by George B. Malone, Bayonne Steel Casting Co., Bayonne, N. J.

Report of the American Foundrymen's Association Committee Advisory to the United States Bureau of Standards, by Dr. Richard Moldenke, Watchung, N. J.

Report of the American Foundrymen's Association Committee on Promotion and Membership, by A. E. Howell, chairman, Nashville, Tenn.

"High-Temperature Cement for Lining Cupolas, etc.," by W. S. Quigley, Quigley Furnace Specialties Co., New York.

Installation of officers.

## Machinery Recovered from the Germans

**The "Recuperation Service" and the "Restitution Service" of the French Ministry of Industrial Reconstitution in July made a report concerning the work of identifying and returning to France of French machinery that had been carried off and made use of by the Germans. Through the end of March, the Restitution Service had shipped from Germany back to the departments in the north of France 1085 tons; at the end of May the total had gone up to 18,511 tons; and since that date, substantial shipments have been made from time to time. The shipments contained casks, glass, and a certain amount of industrial supplies in addition to machinery. There were also 200 carloads, with 2265 tons of machinery shipped from Germany to Alsace, and 2980 tons found and identified in Belgium, shipped back to the original factories in the north of France. The total reshipped into the devastated regions of the north and into Alsace up to the end of May was over 21,000. At that same date, over 15,000 tons of identified machinery was being dismounted and loaded in Germany, and 20,000 tons more had been identified in the Grand Duchy of Luxemburg and in Germany, concerning which the representatives of the French Ministry of Industrial Reconstitution were awaiting instructions from the French manufacturers concerned.**

## Westinghouse Home-Building Program

Due to the difficulty the employees of the Westinghouse Electric and Manufacturing Co. have experienced in getting homes near the East Pittsburgh works, the company has resumed the home-building program that was postponed during the war, and 48 houses are now under construction. The site for the new dwellings is on a plot of 109 acres owned by the company and located in the Wilkins township along the Ardmore Boulevard.

The new houses will form a part of the general building plan for developing the entire tract. It is estimated this tract will furnish homes for 600 families. Sidewalks and paving will be laid, and gas, water and electricity will be installed. The houses which are modern in construction will be of brick with hollow-tile backing, with concrete cellars and cement porches. They will consist mainly of five-, six- and seven-room houses designed to meet the needs and the pocketbooks of the man in moderate circumstances and will be sold at cost on easy terms to the employees of the company. A number of the dwellings will be for rent.

In building the new homes an effort has been made to do away with features that have outlived their usefulness. The antiquated parlor is missing and the center hall has been replaced with a modern living room which is more economical of space. However, the plans are subject to change as the dwellings are designed to meet the approval of the future occupants, whether owners or tenants. Those in charge of the building program have made a careful study of the war-time houses erected by the housing commission, especially those built in the Philadelphia district for the use of the employees of the Essington works.

This company is one of the pioneers in building homes for its employees, having constructed 72 homes near the Trafford foundry almost 10 years ago, as well as owning 127 apartments and homes in Trafford proper. It is likely the building scheme at present under way will later include apartments and duplex houses. T. P. Gaylord, vice president of the Westinghouse company, is in charge of the building program. Bernard H. Prack, the architect and builder, expects to have the first of the houses ready for occupancy by Oct. 1.

* * *

## 1280 Ships Under U. S. Flag

The United States Shipping Board announces that steamships under the American flag now comprise 24.8 per cent. of the world's steam tonnage.

"Today this nation has more ship workers, more shipyards, more shipways, more vessels under construction and is turning them out more rapidly and in greater numbers than now issue from all the shipyards of all the world," the statement says.

"Up to the outbreak of the war we had only 15 vessels of 1000 tons and over engaged in overseas trade. Today, the American flag floats from 1280 oceangoing steamships, 1107 of them built by the United States Shipping Board within the last two years."

## One Automobile to Every 18 People in U. S.

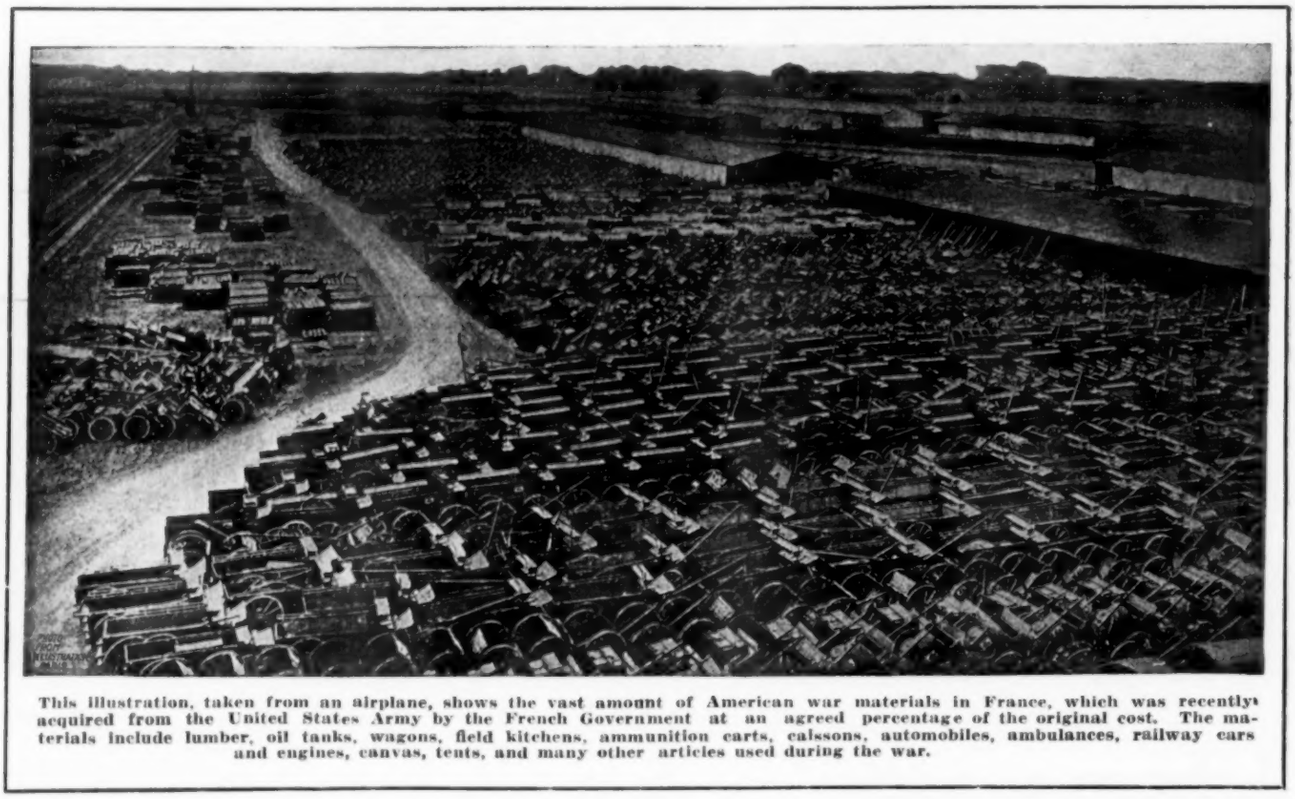
"To get an inkling of the part the automobile plays in the social and business life of this country, it is only necessary to compare the number of cars with the total population of the leading countries of the world," says G. A. Kissel, president of the Kissel Motor Car Co., in a letter to G. P. Moore of the Cleveland Motor Car Sales Co., 1632 Euclid Ave., Cleveland distributor.

"The United States has one automobile to every 18 persons; Great Britain has one car to every 225 persons; France, one car to every 400 people; and Italy and Belgium one to every 840 people. Taking all the cars in the four European countries named, there were at the beginning of the war one motor vehicle to every 353 persons.

"This is all the more remarkable because the population of the United States at that time was 110,000,000 as compared to the total foreign population of 127,000,000 people.

"One reason why the automobile has become more popular in the United States, is because the European manufacturers before the war regarded the motor car as a luxury and designed their models from that standpoint. On the other hand, the American manufacturer has always designed his car as a utility.

"Having his fingers on the pulse of the nation, the American manufacturer knows what owners use their cars for. This enables him to build in those features that, from a mechanical and body-building standpoint, make the American motor car a real and vital transportation factor."



This illustration, taken from an airplane, shows the vast amount of American war materials in France, which was recently acquired from the United States Army by the French Government at an agreed percentage of the original cost. The materials include lumber, oil tanks, wagons, field kitchens, ammunition carts, caissons, automobiles, ambulances, railway cars and engines, canvas, tents, and many other articles used during the war.

# Personals

H. L. MITCHELL, recently with the Wallace Tractor Co., Racine, Wis., has been appointed superintendent of the drilling department of the Hart-Parr Co., Charles City, Iowa.

ERWIN L. MALONE has been appointed Cleveland district representative of the Hess Steel Corporation, Baltimore, Md., with headquarters for the present at the Cleveland Athletic Club, Cleveland, Ohio.

C. E. JOHANSSON of Swedish gage fame arrived in New York on the steamship Stockholm, Aug. 27. While here he will make his headquarters at 245 West 55th St., New York City.

THOMAS SILK, superintendent of the steel barrel and range boiler department of the Whitaker-Glessner Co., Portsmouth, Ohio, has resigned to accept a similar position with the Boyle Manufacturing Co., Los Angeles, Calif.

WARREN LEVENS, formerly assistant general agent of the International Harvester Co., Cedar Falls, Iowa, has been transferred to the company's branch at St. Cloud, Minn., to act in a similar capacity.

H. C. JONES, for several years connected with the Lodge & Shipley Machine Tool Co., Cincinnati, Ohio, as special European representative, has entered the sales organization of the J. R. Stone Tool and Supply Co., Detroit, Mich.

JOHN KOPF has been made manager of the engineering department of the Duff Manufacturing Co., Pittsburgh, Penn. Before joining this company Mr. Kopf was with the Bureau of Aircraft Production at Dayton, Ohio.

C. S. CRANE, formerly supervisor of production and inspection in the motors and vehicles division, Q. M. C., U. S. A., has resigned and is now with the Wilton Tool and Manufacturing Co., Boston, Mass., in the capacity of mechanical and sales engineer.

FRANK R. WEST, formerly with the Penfield Manufacturing Co., Painesville, Ohio, and supervisor of the shell shop at the Hart-Parr Co., Charles City, Iowa, during the war, has been promoted to foreman of the erecting floor at the latter factory.

W. C. EPSTEIN has been appointed general superintendent of the Duff Manufacturing Co.'s works at Pittsburgh, Penn. Mr. Epstein until recently was in charge of the production engineering division of the Bureau of Aircraft Production, New York, and is a graduate of the University of Wisconsin.

E. V. WENZELL has been appointed manager of the grinding-machine division in Chicago and vicinity for the Modern Tool Co., Erie, Penn. Mr. Wenzell was formerly connected with the Norton Grinding Co., and for some time past has been in France doing grinding work. R. H. WOOD will continue to handle the small-tool division of its Chicago office.

EDWARD R. CARDINAL has been appointed district sales manager of the Tacony Steel Co., Tacony, Phila. Mr. Cardinal is well known to the steel trade, having been district sales manager for the Carpenter Steel Co., and until recently president of the Cardinal Tool Co., Philadelphia.

E. M. WEBB, recently discharged from the service as 1st lieutenant, Ordnance Corps, has been appointed shop superintendent of the Duff Manufacturing Co., Pittsburgh. Mr. Webb was stationed at the Rock Island Arsenal in charge of experimental work. Before being commissioned, he was assistant to the production superintendent of the American Tool Works, Cincinnati, Ohio. Mr. Webb is a 1915 graduate of the University of Cincinnati.

A. A. SCHNEIDER, formerly with the raw materials department of the Midvale Steel and Ordnance Co. and Cambria Steel Co., Pittsburgh, Penn., has been appointed manager of the raw materials division of the American Steel Export Co., New York City. Prior to entering military service in 1917 as a lieutenant of field artillery, Mr. Schneider was for several years assistant to H. F. Black, of the Midvale and Cambria companies.

HARRY M. GILES has been appointed general superintendent of the South Philadelphia Works of the Westinghouse Electric and Manufacturing Co. Mr. Giles, who succeeds the late Oscar Otto, killed in an automobile accident last month, has risen from the ranks in the Westinghouse organization. For a number of years past he has been superintendent of marine erection, a position to which he was appointed by H. T. Herr when the electric company absorbed the machine company.

# Business Items

The Bronzo Alumina Corporation has removed its shop from Tonawanda to 212-218 Winchester Ave., Buffalo, N. Y.

The T. P. Walls Tool and Supply Co., Inc., 75-77 Walker St., New York City, has been appointed Eastern agents for the Advance Tool Co., Cincinnati, Ohio.

The Moore Drop-Forging Co., Springfield, Mass., has purchased the Page-Storms Drop-Forge Co., and will carry on its business in flat wrenches in connection with its line of Stillson wrenches.

The Dickey Steel Co., Inc., Woolworth Building, New York City, has been appointed sales representative for New York and Philadelphia district of the Worcester Pressed Steel Co., Worcester, Mass.

S. S. Zolotorofe and Louis Birk, both formerly with the John Polachek Bronze and Iron Co., have organized and have become associated under the firm name of Superb Bronze and Iron Co., Inc., with offices and plant at 254-258 Park Ave., Brooklyn, New York.

The Worthington Pump and Machinery Corp. announces the purchase of the plant, accounts and other assets of the Epping-Carpenter Pump Co., Pittsburgh, Penn. The plant will be operated as the Epping-Carpenter Works, and will be situated at 10 Forty-third St., Pittsburgh, Penn.

The Victor Tool Co., Waynesboro, Penn., has appointed the J. R. Stone Tool and Supply Co., 997 Woodward Ave., Detroit, Mich., as its agents for the State of Michigan. The company will handle its line of self-opening die heads, collapsible and adjustable taps, reamer holders and nut facing machines and will carry a stock of these tools in its Detroit office.

The A. R. Purdy Co., Inc., authorized the board of directors to increase the capitalization from $10,000 to $100,000. There will be no change in the management of the company, which will continue its business at 125-127 Christopher St., New York. A new warehouse has recently been leased at 506 Hudson St., and after alterations have been made it will be connected up with the main warehouse and offices.

The Electrolytic Oxy-Hydrogen Laboratories, Inc., announce the formation of a sales and manufacturing company under the name of the Electrolabs Co. Electrolytic Oxy-Hydrogen Laboratories, Inc., will continue in charge of the laboratories and maintain a technical supervision over the work of the new company. The general offices and works of both companies have been moved from Dayton, Ohio, into larger quarters at 2635 Penn Ave., Pittsburgh, Penn. The general sales offices are being continued at 15 William St., New York, and branch sales offices have been opened in Morris Building, Philadelphia, and the Merchants Exchange Building, San Francisco. I. H. Levin will continue in charge of technical and research work, and D. J. Tonkonogy in general charge of sales.

The Directors of American Car and Foundry Co. recently abolished the office of general manager. James M. Buick, formerly vice president and general manager, has assumed the direction of the sales division of the company and will be known as vice president in charge of sales. The production division will be directed by William C. Dickerman who will be designated as vice president in charge of operations. He will be assisted by Frederick A. Stevenson, known as assistant vice president in charge of operations, who will be head of the manufacturing section, and have charge of production in the car plants, rolling mills and foundries. There will also come under Mr. Dickerman's supervision the engineering, improvement and research, patent and industrial relations sections. The headquarters of both divisions will be at the general office of the company, No. 165 Broadway, New York.

# Export Opportunities

**The Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., has inquiries for the agencies of machinery and machine tools. Any information desired regarding these opportunities can be secured from the above address by referring to the number following each item.**

Agencies are desired by a society in Belgium for the sale of machine tools for metals and wood, drill presses, lathes, etc., and industrial supplies of all sorts. Quotations should be given c.i.f. Antwerp. References. No. 30,220.

The purchase is desired by a firm in Spain of boring machines, drilling machines, punches, lathes, files, machinery, and tools of all kinds, and mining machinery, and transmission machinery and equipment. Quotations should be given c.i.f. Spanish port. Terms, cash against documents, but short-term blank acceptance is preferred. Correspondence may be in English. References. No. 30,222.

The purchase and exclusive agencies are desired by an importer in Spain for chemical products, fertilizers, agricultural machinery, tractors, railway supplies, tanned leather, mining machinery, lumber and staves, and lubricating oils. Quotations should be given f.o.b. New York or c.i.f. Spanish city. Payments, usual credit terms desired. Correspondence may be in English. References. No. 30,189.

An agency is desired by a man in Algeria for the sale of groceries, agricultural tractors, motor cars, and insurance. Quotations should be given c.i.f. Algeria. Payment against documents. Correspondence should be in French. References. No. 30,221.

The purchase of and agencies for lathes, drill presses, small tools for machinists, taps, dies, and hoisting machinery are desired by a firm in Czechoslovakia. Reference. No. 30,195.

An export and import house in this country with agencies in India and England is desirous of communicating with dealers in gasoline and kerosene tractors, pleasure cars, and motor trucks, with a view to securing agencies for selling in Morocco. References. No. 30,194.

A firm in Switzerland wishes to secure the agency for the sale of stationary motors and engines driven by gasoline, kerosene, and electricity (horizontal 20 to 120 hp.), compressor, cranes, rigs and mining machinery. Correspondence may be in English. Reference. No. 30,060.

The representative of a firm in Sweden, who is at present in this country, desires to secure an agency for the sale in Scandinavia of boring, milling, and drilling machinery, shipyard machinery, locomotive-building machinery, and tools of all kinds. Reference. No. 30,063.

# Trade Catalogs

**S. & C. Easy Lock Holders.** S. & C. Manufacturing Co., Detroit, Mich. Catalog; 8 x 11 in.; pp. 6. This contains illustrations and price list of the S. & C. interchangeable counterbores and easy lock holders.

**Cooper Hewitt Electric Lamps.** Cooper Hewitt Electric Co., Hoboken, N. J. Bulletin No 78; 10 x 7 in.; pp., 24. It describes and illustrates its various lamps used for photographic purposes and also gives brief specifications. Copies of this bulletin will be sent free upon request to any firm or individual using artificial light for photographic purposes.

**Large Power Drives.** Morse Chain Co., Ithaca, N. Y. Catalog No. 14; 6 x 9 in.; pp., 20. Illustrates and describes the Morse silent chain and shows a few of the many large power drives.

**Internal Grinder.** Worcester Machine Works, Inc., Worcester, Mass. Circular; 11 x 9 in. It describes the extreme accuracy, efficient production, unit control of the internal grinding machine.

**T-W Independent Lathe Chucks.** Terkelsem & Wennberg, Boston, Mass. A single-page circular describing and illustrating the T-W independent lathe chucks.

**Reactions.** Metal & Thermit Corporation, 120 Broadway, New York City. Catalog; 8 x 10½ in.; pp., 48. Contains interesting articles on the repairs with Thermit of the broken stem post of the "Northern Pacific," and on the repairs of large crankshafts; also the repairs of various railroads shop work.

**Gears.** R. D. Nuttall Co., Tractor Dept., 2133 Conway Building, Chicago, Ill. Catalog, entitled "Pedigreed Gears;" 6 x 8½ in.; pp., 16. Tells of the gears and transmissions built by this company for use in tractors. A number of transmission units are illustrated.

**Gisholt School.** Gisholt Machine Co., Madison, Wis. Booklet entitled "Gisholt Production in Your Shop;" 7½ x 9 in.; pp., 16. This booklet tells of the school run by the Gisholt company for training the employees of firms using the Gisholt lathes so that maximum production and the best work can be secured.

**Alternating-Current Welding Apparatus.** Electric Arc Cutting and Welding Co., 222 Halsey St., Newark, N. J. Catalog; 6 x 9 in.; pp., 24. This catalog describes and illustrates the portable, alternating-current arc-welding apparatus made by this concern. A number of tables are included as well as charts showing the proper methods for the preparation of parts to be welded and its methods of welding.

**Trucktractor.** Clark Trucktractor Co., Chicago., Ill. Catalog; 6 x 9 in.; pp., 16. Gives specifications and illustrations of the Clark Trucktractor. This is a machine using a gasoline engine for motive power and intended for use in factories, yards, mills, etc.

**The Wellman-Seaver-Morgan Co.,** Cleveland, Ohio, has issued bulletin No. 27, which describes and illustrates W-S-M automatic ore unloaders on the Great Lakes. A copy of the bulletin may be had free upon request.

**S. F. Bowser & Co., Inc.,** Fort Wayne, Ind., has issued a little folder which illustrates and describes a Bowser battery storage system for lubricating oil. It shows how tanks of varying capacity may be placed in battery, all of uniform height.

**Hose Coupling.** Independent Pneumatic Tool Co., 600 West Jackson Blvd., Chicago, Ill. Circular; 9 x 6 in.; pp. 4. This circular illustrates and describes the Thor hose coupling; a price list is also included.

**Bulletin No. 25.** Wellman-Seaver-Morgan Co., Cleveland, Ohio. This bulletin does not advertise any of its products but simply gives valuable data which has been prepared by one of its engineers. A copy will be sent free to all engineers and draftsmen upon request.

**Standard Thread Miller No. 24.** Smalley General Co., Bay City, Mich. Catalog; 8½ x 11 in.; pp. 4. A description of the Smalley General thread-milling machine, which is a single-purpose machine especially adapted to production work; specifications also included.

**Metal-Working Machinery.** Allied Machinery Co. of America, New York City. Catalog; 11½ x 9 in. A presentation of modern tools for general manufacturing; toolroom and precision work also for use in machine shops, industrial plants, etc. A map is given to show the centers of machine-tool production in the United States.

**Sprague Adjustable Loop System.** Sprague Electric Works of the General Electric Co., 527-531 West 34th St., New York City. Bulletin No. 48,713; 10½ x 8 in.; pp. 15. This bulletin is devoted to a description of the function, operation and construction of an overhead mechanical system for handling miscellaneous and bulk freight and materials in terminals.

**Standard Cutter.** Cleveland Milling Machine Co., Cleveland, Ohio. Catalog B; pp. 144. This catalog contains sizes and prices on standard cutters and illustrations of machine tools which are manufactured by this company; also many tables which will be of interest to engineers and mechanics.

**Thread Lead Test Indicator.** George J. Wolf, 346 Connecticut Ave., Bridgeport, Conn. The illustrations in this folder shows the indicator completed with standard set gage for setting ball points in indicator; also an adjustable centering gage for testing thread gages, etc., on a center line.

**Flow Indications for Welding and Cutting.** Hydrex Engineering Corp., 72 West Eagle St., Buffalo, N. Y. Booklet; 5½ x 8 in.; pp. 8. Describes a line of flow indicators for use in autogenous welding. These indicators are connected in the fuel lines and are said to enable the operator to standardize the flame and keep it uniform and of the type desired.

# New Publications

**Among Industrial Workers.** One hundred and sixty, 9 x 6-in. pages with 100 illustrations. Published by the Association Press, 347 Madison Ave., New York City. Regular edition and special edition.

A handbook for the Young Men's Christain Association in industrial fields. It is an encyclopedia of needed information on all points concerning the association at work in the field of industry, and an invaluable volume for promotion purposes. It gives 160 pages of up-to-date information of plans, policies, progress; also 100 illustrations of the activities in the association.

**Analysis of Babbitt.** By James Brakes. One hundred and sixty-nine 5 x 6¾-in. pages, bound in cloth. Published by the Allen Book and Printing Co., Troy, N. Y.

Intended as a concise practical book on the analysis of babbitt, explaining the properties, qualitative, quantitative, volumetric and electrolytic analysis of antimony, tin, lead, copper, etc. A bibliography of white metals, white-metal alloys and books on metallurgical engineering is also included

# Forthcoming Meetings

The Association of Iron and Steel Electrical Engineers will hold its convention in St. Louis, Sept. 22-26.

The American Bankers' Association will hold its 45th annual convention in St. Louis, Sept. 29 to Oct. 2.

The American Mining Congress will hold its 22nd annual convention in St. Louis, Nov. 17-21.

American Foundrymen's Association. Annual convention and exhibit will be held in Philadelphia the week of Sept. 29, 1919. C. E. Hoyt, secretary, 111 West Monroe St., Chicago, Ill.

The American Steel Treaters' Society will hold its annual convention and exhibition at the Seventh Regiment Armory, Chicago, Ill., Sept. 22 to 27. Al. J. Murphy, 154 East Erie St., Chicago, Ill., is chairman of the exhibit committee.

Boston Branch, National Metal Trades Association. Monthly meeting on first Wednesday of each month, alternating with the Employers' Association of eastern Massachusetts. George D. Berry, secretary, room 50-51, 166 Devonshire St., Boston, Mass.

Electric Hoist Manufacturers' Association. Monthly meeting at the offices of the Yale & Towne Manufacturing Co., 9 East 40th St., New York City. Secretary W. C. Briggs, Shepard Electric Crane and Hoist Co.

Engineers' Club of Philadelphia. Regular meeting the third Tuesday of the month. Lewis H. Kenney is the chairman of committee on papers.

Engineers Society of western Pennsylvania. Monthly meeting, third Tuesday; section meeting, first Tuesday. Elmer K. Hiles, secretary, Oliver Building, Pittsburgh, Penn.

The International Trade Conference called by the Chamber of Commerce of the United States will be held in Atlantic City on Sept. 30 to Oct. 6. Homer L. Ferguson is the president of the National Chamber and A. C. Bedford is the chairman of the executive committee of the conference.

Philadelphia Foundrymen's Association. Meeting first Wednesday of each month. Manufacturers' Club, Philadelphia, Penn., Howard Evans, secretary, Pier 45, North Philadelphia, Penn.

Rochester Society of Technical Draftsmen. Monthly meeting last Thursday. O. L. Angevine, Jr., secretary, 547 Arnett Boulevard, Rochester, N. Y.

The National Machine Tool Builders' Association will hold its annual convention at the Hotel Astor, New York City, Oct. 15 and 16. Chas. E. Hildreth, Worcester, Mass., is general manager, and C. Wood Walter, Cincinnati, Ohio, is secretary.

The National Safety Council will hold its eighth annual Safety Congress in Cleveland, Oct. 1 to 4 at Hotel Statler.

# Condensed-Clipping Index of Equipment

*Clip, paste on 3 x 5-in. cards and file as desired*

**Sclerometer, Magnetic**
Automatic and Electric Furnaces, Ltd., London, Eng.
"American Machinist," Aug. 28, 1919

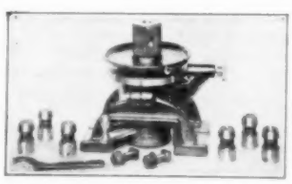
May be used for determining the refining temperature of mild steel, hardening temperatures of carbon and alloy steels, and requirements for correct normalizing and annealing. The readings of the instruments are in terms of Maxwell-turns and C. G. S. units of coercive force so that the results are in absolute international units.

**Chuck, "Lavoie" Air**
Frontier Chuck and Tool Co., 36 Letchworth St., Buffalo, N. Y.
"American Machinist," Sept. 4, 1919

No gears used, clamping mechanism being of wedge and lever type. Release spring fitted to eliminate necessity for double piping. Made in seven types; small sizes with either 2 or 3 jaws, medium with 3 or 4, large with 3, 4 or 5. Six types of solid or detachable jaws provided.

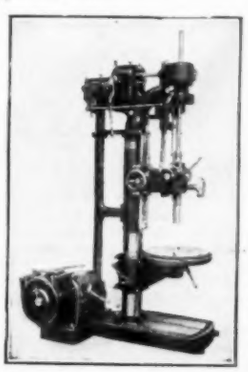
**Collet, Spring and Head, Indexing**
John Bath & Co., Inc., Worcester, Mass.
"American Machinist," Sept. 4, 1919

Collet bottoms against chuck and is prevented from rotating by a pin engaging in collet skirt. Compression of jaws by knurled nut eliminates draw-in tubes and thus permits handling of larger stock. Chuck can be fitted to any lathe faceplate. Collet is combined with indexing head provided with separate notched cast-iron index plates for milling-machine work. Separate plate can easily be made for each job. Indexing by ball ratchet. Equipment includes spanner and six collets.

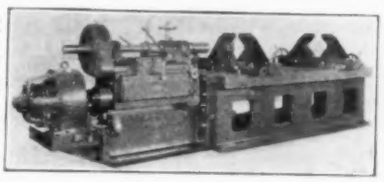


**Milling Machine, Heavy-Duty Upright**
Fosdick Machine Tool Co., Cincinnati, Ohio.
"American Machinist," Sept. 4, 1919

Drills to the center of 25 in.; maximum distance, spindle to base, 49¼ in.; maximum distance, spindle to table, 33¾ in.; spindle takes No. 4 Morse taper shanks; 12 spindle speeds, 49 to 550 r.p.m.; five geared feeds, 0.004 to 0.028 in. per revolution of spindle; net weight, about 2350 lb.; power required for average work, 3 to 5 hp.; power required for continuous maximum performance, 7½ horsepower.

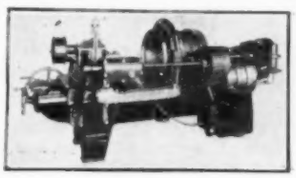


**Drilling and Boring Machine, Horizontal, No. 519**
Baker Bros., Toledo, Ohio.
"American Machinist," Sept. 4, 1919



For heavy-duty work, such as drilling connecting rods for emergency fleet engines. Will drive 5-in. high-speed drills in steel to the limit of their efficiency and can be used for boring and enlarging holes in steel up to 14 in. in diameter. Constant-speed drive through train of hardened gears, running in oil. Eight speeds from 11 to 151 r.p.m. available; 12 drilling and 12 reaming feeds provided and also automatic back feed.

**Milling Machine, Flange-Thread No. 1**
Smalley-General Co., Inc., Bay City, Mich.
"American Machinist," Sept. 4, 1919

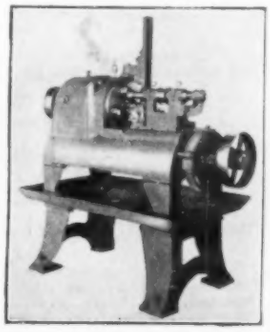


Capacity, up to 16-in. inside diameter threads with 3-in. diameter hob; swing over bed, 27-in.; maximum distance from face of chuck to end of milling spindle, 24 in.; gears furnished for 11½-, 10- and 8-pitch threads, others can be furnished extra if desired; three milling speeds, maximum 1½ times minimum; floor space, 5 ft. 9 in. by 11 ft.; standard taper in milling spindle, No. 13 Brown and Sharpe; taper attachment is provided; approximate horsepower required, 5 to 7, depending on work; weight, 8300 lb., net, exclusive of countershaft.

**Gage, Cylinder Bore-Testing**
Coats Machine Tool Co., 110 West 40th St., New York City.
"American Machinist," Sept. 4, 1919

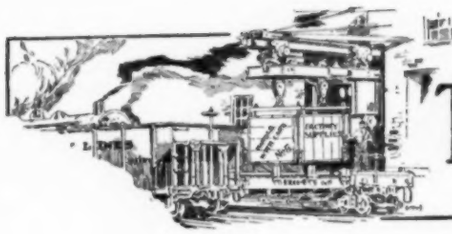
This fitting makes the Prestometer fluid micrometer gage of this company available for testing the bore of automotive cylinders. Large hollow plug containing fluid has metal diaphragm against which a contact pin presses. Contact pin follows inside surface of cylinder and transmits any unevenness through diaphragm and fluid to indicating tube. Various sizes of plugs, packing pieces and rings can be supplied as desired.

**Nut Semi-Finishing Machine**
Kent Machine Co., Kent, Ohio.
"American Machinist," Sept. 4, 1919



Four-station horizontal turret machine with hand-loaded magazine feed. Roughing and semi-finishing cuts taken at second and third stations respectively. Work put on and removed at first and fourth stations respectively. Nut revolves on its own axis, making chamfer concentric with axis of screw thread. Machine runs continually. Weight, 3000 lb.

*Patented Aug. 20, 1918*



# THE WEEKLY PRICE GUIDE

## IRON AND STEEL

**PIG IRON**—Quotations compiled by The Matthew Addy Co., as per Department of Commerce Committee Schedule.

| CINCINNATI | Current | One Month Ago |
|---|---|---|
| No. 2 Southern | $30.35 | $36.90 |
| Northern Basic | 27.55 | 27.55 |
| Southern Ohio No. 2 | 28.55 | 28.55 |
| NEW YORK—TIDEWATER DELIVERY | | |
| 2X Virginia (Silicon 2.25 to 2.75) | 32.40 | 34.40 |
| Southern No. 2 (Silicon 2.25 to 2.75) | 35.20 | 33.95 |
| BIRMINGHAM | | |
| No. 2 Foundry | 29.25 | 28.00 |
| PHILADELPHIA | | |
| Eastern Pennsylvania No. 2 | 29-30 | 30.65 |
| Virginia No. 2 | 33.10 | 32.10-34.10 |
| Basic | 26.75 | 29.90 |
| Grey Forge | 26.75 | 29.90 |
| CHICAGO | | |
| No. 2 Foundry local | 26.75 | 26.75 |
| No. 2 Foundry, Southern | 28.00 | 28.00 |
| PITTSBURGH, INCLUDING FREIGHT CHARGE FROM VALLEY | | |
| No. 2 Foundry | 28.15 | 28.15 |
| Basic | 27.15 | 32.00 |
| Bessemer | 29.35 | 35.20 |

* F. o. b. furnace. † Delivered.

**STEEL SHAPES**—The following base prices per 100 lb. are for structural shapes 3 in. by ¼ in. and larger, and plates ¼ in. and heavier, from jobbers' warehouses at the cities named:

| | — New York — | | | — Cleveland — | | — Chicago — | |
|---|---|---|---|---|---|---|---|
| | Current | One Month Ago | One Year Ago | Current | One Year Ago | Current | One Year Ago |
| Structural shapes | $3.47 | $3.47 | $4.245 | $3.37 | $4.17 | $3.47 | $4.27 |
| Soft steel bars | 3.37 | 3.37 | 4.145 | 3.27 | 4.07 | 3.37 | 4.17 |
| Soft steel bar shapes | 3.37 | 3.37 | 4.145 | 3.27 | 4.17 | 3.37 | 4.17 |
| Soft steel bands | 4.07 | 4.07 | 4.995 | ..... | ..... | ..... | ..... |
| Plates, ¼ to 1 in. thick | 3.67 | 3.67 | 4.495 | 3.57 | 4.42 | 3.67 | 4.25 |

Note—For less than carload lots add 4½c. per 100 lb.

**BAR IRON**—Prices per 100 lb. at the places named are as follows.

| | Current | One Year Ago |
|---|---|---|
| Mill, N. Y. | $2.77 | $3.50 |
| Warehouse, New York | 3.37 | 4.75 |
| Warehouse, Cleveland | 3.27 | 4.10 |
| Warehouse, Chicago | 3.37 | 4.10 |

**SHEETS**—Quotations are in cents per pound in various cities from warehouse; also the base quotations from mill:

| | Mill, Carloads Pittsburgh | — New York — Current | — New York — One Year Ago | Cleveland | Chicago |
|---|---|---|---|---|---|
| No. 28 black | 4.35 | 5.50 | 6.495 | 5.27 | 5.62 |
| No. 26 black | 4.25 | 5.40 | 6.395 | 5.17 | 5.52 |
| Nos. 22-24 black | 4.20 | 5.35 | 6.345 | 5.12 | 5.47 |
| Nos. 18-20 black | 4.15 | 5.30 | 6.295 | 5.07 | 5.42 |
| No. 16 blue annealed | 3.75 | 4.77 | 5.695 | 4.67 | 4.77 |
| No. 14 blue annealed | 3.65 | 4.67 | 5.595 | 4.57 | 4.67 |
| No. 10 blue annealed | 3.55 | 4.57 | 5.495 | 4.47 | 4.57 |
| No. 28 galvanized | 5.70 | 6.75 | 7.745 | 6.62 | 6.97 |
| No. 26 galvanized | 5.40 | 6.45 | 7.445 | 6.32 | 6.67 |
| No. 24 galvanized | 5.25 | 6.30 | 7.295 | 6.17 | 6.37 |

**COLD FINISHED STEEL**—Warehouse prices are as follows:

| | New York | Chicago | Cleveland |
|---|---|---|---|
| Round shafting or screw stock, per 100 lb. base | $5.00 | $4.90 | $4.75 |
| Flats, squares and hexagons, per 100 lb. base | 5.50 | 5.40 | ..... |

**DRILL ROD**—Discounts from list price are as follows at the places named:

| | |
|---|---|
| New York | 50% |
| Cleveland | 50% |
| Chicago | 50% |

**SWEDISH (NORWAY) IRON**—The average price per 100 lb., in ton lots is:

| | Current | One Year Ago |
|---|---|---|
| New York | $21.00-26.00 | $15.50-19 |
| Cleveland | 20.00 | 20.00 |
| Chicago | 16.50 | 19.00 |

In coils an advance of 50c. usually is charged.
Domestic iron (Swedish analysis) is selling at 15c. per lb.

**WELDING MATERIAL (SWEDISH)**—Prices are as follows in cents per pound f.o.b. New York, in 100 lb. lots and over:

| Welding Wire | | Cast-Iron Welding Rods | |
|---|---|---|---|
| 3/32, 1/8, 5/32, 3/16, 7/32, 1/4, 9/32, 5/16, No. 8, 11/32 and No. 10 | 21.00 to 30.00 | 1/4 by 12 in. long | 14.00 |
| 3/8 | | 5/16 by 19 in. long | 12.00 |
| No. 12 | | 3/8 by 19 in. long | 10.00 |
| 7/16, No. 14 and 1/2 | | 1/2 by 21 in. long | 10.00 |
| No. 18 | | Special Welding Wire, Coated | |
| No. 20 | | 1/8 | 33.00 |
| Domestic 20c. for 1/16, 15c. for 1/8 to 1/4. | | 5/32 | 30.00 |
| | | 3/16 | 38.00 |

**MISCELLANEOUS STEEL**—The following quotations in cents per pound are from warehouse at the places named:

| | New York Current | Cleveland Current | Chicago Current |
|---|---|---|---|
| Openhearth spring steel (heavy) | 6.50 | 8.00 | 8.00 |
| Spring steel (light) | 10.00 | 11.25 | 11.00 |
| Coppered bessemer rods | 8.00 | 8.00 | 6.75 |
| Hoop steel | 4.07 | 4.75 | 4.07 |
| Cold-rolled strip steel | 8.40 | 8.25 | 7.50 |
| Floor plates | 5.67 | 6.00 | 5.92 |

Note—For less than carload lots add 4½c. per 100 lb.

**PIPE**—The following discounts are for carload lots f.o.b. Pittsburgh: basing card of National Tube Co. for steel pipe, Cardry A. M. Byer's Co. for iron, both dated Mar. 21, 1919.

BUTT WELD

| Steel Inches | Black | Galvanized | Iron Inches | Black | Galvanized |
|---|---|---|---|---|---|
| 1/8, 1/4 and 3/8 | 50½% | 24% | 3/8 to 1/2 | 39½% | 23½% |
| 1/2 | 54½% | 40% | | | |
| 3/4 to 3 | 57½% | 44% | | | |

LAP WELD

| | | | | | |
|---|---|---|---|---|---|
| 2 | 50½% | 35% | 2 | 32½% | 18½% |
| 2½ to 6 | 53½% | 41% | 2½ to 6 | 34½% | 21½% |

BUTT WELD, EXTRA STRONG PLAIN ENDS

| | | | | | |
|---|---|---|---|---|---|
| 1/8, 1/4 and 3/8 | 46½% | 29% | 3/4 to 1½ | 39½% | 24½% |
| 1/2 | 51½% | 39% | | | |
| 3/4 to 1½ | 55½% | 43% | | | |

LAP WELD, EXTRA STRONG PLAIN ENDS

| | | | | | |
|---|---|---|---|---|---|
| 2 | 48½% | 37% | 2 | 33½% | 20½% |
| 2½ to 4 | 51½% | 40% | 2½ to 4 | 35½% | 23½% |
| 4½ to 6 | 50½% | 39% | 4½ to 6 | 34½% | 22½% |

Stock discounts in cities named are as follows:

| | — New York — Black | — New York — Galvanized | — Cleveland — Black | — Cleveland — Galvanized | — Chicago — Black | — Chicago — Galvanized |
|---|---|---|---|---|---|---|
| 1/8 to 3 in. steel butt welded | 47% | 31% | 43½% | 34½% | 57½% | 44% |
| 2½ to 6 in. steel lap welded | 42% | 27% | 45½% | 30½% | 53½% | 41% |

Malleable fittings. Class B and C, banded, from New York stock sell at plus 12½% less 5%. Cast iron, standard sizes, 10-5% off.

## METALS

**MISCELLANEOUS METALS**—Present and past New York quotations in cents per pound, in carload lots:

| | Current | One Month Ago | One Year Ago |
|---|---|---|---|
| Copper, electrolytic | 22.50 | 24.00 | 26.00 |
| Tin in 5-ton lots | 56.50 | 60.00 | 83.00 |
| Lead | 6.25 | 5.90 | 8.05 |
| Spelter | 7.60 | 7.95 | 9.50 |
| ST. LOUIS | | | |
| Lead | 6.00 | 5.50 | 7.75 |
| Spelter | 7.15 | 7.60 | 9.25 |

At the places named, the following prices in cents per pound prevail, for 1 ton or more:

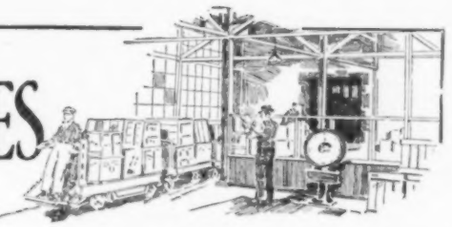
| | — New York — Current | — New York — One Month Ago | — New York — One Year Ago | — Cleveland — Current | — Cleveland — One Year Ago | — Chicago — Current | — Chicago — One Year Ago |
|---|---|---|---|---|---|---|---|
| Copper sheets, base | 33.50 | 33.50 | 38.00 | 35.50 | 38.00 | 36.50 | 33.50 |
| Copper wire (carload lots) | 29-30.75 | 28.25 | 35.00 | 30.50 | 35.00 | 26.00 | 33.00 |
| Brass sheets | 32.00 | 27.75 | 39.75 | 33.00 | 37.00 | 28.00 | 31.50 |
| Brass pipe | 36.00 | 36.00 | 46.00 | 39.00 | 42.00 | 37.00 | 41.50 |
| Solder (half and half) (case lots) | 45.00 | 45.00 | 58.00 | 41.00 | 57.50 | 38.50 | 56.00 |

Copper sheets quoted above hot rolled 16 oz., cold rolled 14 oz. and heavier, add 1c.; polished takes 1c. per sq.ft. extra for 20-in. widths and under; over 20 in., 2c.

**BRASS RODS**—The following quotations are for large lots, mill. 100 lb. and over, warehouse; net extras:

| | Current | One Year Ago |
|---|---|---|
| Mill | $24.00 | $32.25 |
| New York | 28-29.75 | 34.25 |
| Cleveland | 29.00 | 36.60 |
| Chicago | 27.00 | 29.50 |

# SHOP MATERIALS AND SUPPLIES



**ZINC SHEETS**—The following prices in cents per pound prevail:

Carload lots f. o. b. mill..... 11.00

| | In Casks | | Broken Lots | |
|---|---|---|---|---|
| | Current | One Year Ago | Current | One Year Ago |
| Cleveland | 12.50 | 18.75 | 13.00 | 18.40 |
| New York | 11.50 | 16.50 | 12.50 | 17.00 |
| Chicago | 16.50 | 22.00 | 16.00 | 21.50 |

**ANTIMONY**—Chinese and Japanese brands in cents per pound, in ton lots for spot delivery, duty paid:

| | Current | One Year Ago |
|---|---|---|
| New York | 9.50 | 14.00 |
| Chicago | 9.75 | 15.00 |
| Cleveland | 12.00 | 17.125 |

**OLD METALS**—The following are the dealers' purchasing prices in cents per pound:

| | New York | | Cleveland | | |
|---|---|---|---|---|---|
| | Current | One Year Ago | Current | One Year Ago | Chicago |
| Copper, heavy and crucible | 17.00 | 24.00 | 18.50 | 24.75 | 19.00 |
| Copper, heavy and wire | 16.00 | 22.50 | 19.00 | 24.00 | 18.50 |
| Copper, light and bottoms | 14.00 | 20.50 | 16.00 | 22.00 | 17.50 |
| Lead, heavy | 4.75 | 7.00 | 5.00 | 8.00 | 5.25 |
| Lead, tea | 3.75 | 5.25 | 3.50 | 6.00 | 4.375 |
| Brass, heavy | 10.50 | 14.75 | 15.50 | 17.00 | 18.50 |
| Brass, light | 7.50 | 11.00 | 10.00 | 13.00 | 11.50 |
| No. 1 yellow brass turnings | 10.00 | 13.75 | 11.50 | 16.00 | 11.00 |
| Zinc | 5.00 | 6.50 | 5.00 | 6.00 | 6.00 |

**ALUMINUM**—The following prices are from warehouse at places named:

| | New York | Cleveland | Chicago |
|---|---|---|---|
| No. 1 aluminum, 98 to 99% pure, in ingots for remelting (1-15 ton lots), per lb. | 35c.–37c. | 32.00c.@33.00c. | 33½c. |

**COPPER BARS** from warehouse sell as follows in cents per pound, for ton lots and over:

| | Current | One Year Ago |
|---|---|---|
| New York | 32.00 | 32.00 |
| Chicago | 31.00 | 38.00 |
| Cleveland | 35.00 | 36.50 |

**BABBITT METAL**—Warehouse price per pound:

| | New York | | Cleveland | | Chicago | |
|---|---|---|---|---|---|---|
| | Current | One Year Ago | Current | One Year Ago | Current | One Year Ago |
| Best grade | 90.00 | 110.00 | 70.00 | 98.00 | 60.00 | 96.00 |
| Commercial | 50.00 | 50.00 | 16.50 | 23.00 | 13.00 | 25.00 |

## SHOP SUPPLIES

New York prices will be revised in next week's issue.

**NUTS**—From warehouse at the places named, on fair-sized orders, the following amount is deducted from list:

| | New York | | Cleveland | | Chicago | |
|---|---|---|---|---|---|---|
| | Current | One Year Ago | Current | One Year Ago | Current | One Year Ago |
| Hot pressed square | $1.50 | +$2.50 | $2.25 | $1.20 | $1.85 | $1.05 |
| Hot pressed hexagon | 1.50 | +2.50 | 2.25 | 1.00 | 1.85 | .85 |
| Cold punched hexagon | 1.50 | +2.50 | 2.25 | .75 | 1.30 | 1.00 |
| Cold punched square | 1.50 | +2.50 | 2.25 | .75 | 1.30 | 1.00 |

Semi-finished nuts sell at the following discounts from list price:

| | Current | One Year Ago |
|---|---|---|
| New York | 50-10% | 50% |
| Chicago | 50% | 50% |
| Cleveland | 60-10% | 50% |

**MACHINE BOLTS**—Warehouse discounts in the following cities:

| | New York | Cleveland | Chicago |
|---|---|---|---|
| ½ by 4 in. and smaller | 50% | 50% | 50–5% |
| Larger and longer up to 1½ in. by 30 in. | 40% | 40% | 40–5% |

**WASHERS**—From warehouses at the places named the following amount is deducted from list price:

For wrought-iron washers:

New York.....$1.25 Cleveland.....$3.75 Chicago.....$3.00

For cast-iron washers the base price per 100 lb. is as follows:

New York.....$6.00 Cleveland.....$3.75 Chicago.....$4.25

**CARRIAGE BOLTS**—From warehouses at the places named the following discounts from list are in effect:

| | New York | Cleveland | Chicago |
|---|---|---|---|
| ½ by 6 in. and smaller | 45–5% | 40–5% | 50–5% |
| Larger and longer up to 1 in. by 30 in. | 35% | 37½% | 30–10% |

**COPPER RIVETS AND BURS** sell at the following rate from warehouse:

| | Rivets | | Burs | |
|---|---|---|---|---|
| | Current | One Year Ago | Current | One Year Ago |
| Cleveland | 20% | List plus 10% | 10% | List plus 10% |
| Chicago | 20% | List price | 20% | List plus 20% |
| New York | 40% | 20% from list | 20% | List plus 20% |

**RIVETS**—The following quotations are allowed for fair-sized orders from warehouse:

| | New York | Cleveland | Chicago |
|---|---|---|---|
| Steel ½ and smaller | 50–10% | 55% off | 55% |
| Tinned | 50–10% | 55% off | 55% |

Boiler, ½, ¾, 1 in. diameter by 2 in. to 5 in. sell as follows per 100 lb.:

New York...$5.25 Cleveland...$4.00 Chicago....$4.87 Pittsburgh...$4.65

Structural, same sizes:

New York...$5.35 Cleveland...$4.10 Chicago....$4.97 Pittsburgh...$4.75

## MISCELLANEOUS

**SEAMLESS DRAWN TUBING**—The base price in cents per pound from warehouse in 100-lb. lots is as follows:

| | New York | Cleveland | Chicago |
|---|---|---|---|
| Copper | 37.50 | 41.50 | 38.50 |
| Brass | 36.00 | 39.00 | 37.00 |

For immediate stock shipment 3c. is usually added. The prices, of course, vary with the quantity purchased. For lots of less than 100 lb., but not less than 75 lb., the advance is 2c.; for lots of less than 75 lb., but not less than 50 lb., the advance is 5c. over base (100-lb. lots); for less than 50 lb., but not less than 25 lb., 10c. should be added to the base price; and for quantities of from 10 to 25 lb. the extra is 25c.; less than 10 lb., add 35c.

Double above extras will be charged for angles, channels and sheet-metal mouldings if ordered in above quantities. The above extras also apply to brass rod other than standard stock sizes—stock sizes being considered as ¼ up to 2 in. inclusive in rounds, and ½ up to 1½ in., inclusive in square and hexagon—all varying by thirty-seconds up to 1 in. and by sixteenths over 1 in. On all shipments aggregating less than 100 lb. there is usually a boxing charge of $1.50.

**LONG TERNE PLATE**—For No. 28 primes, from Stock, the price in Chicago is $7.75 per 100 lb.

**COTTON WASTE**—The following prices are in cents per pound:

| | New York | | Cleveland | Chicago |
|---|---|---|---|---|
| | Current | One Year Ago | | |
| White | 13.00 | 11.00–13.00 | 14.00 | 11.00 to 14.00 |
| Colored mixed | 9.00 to 12.00 | 8.50–12.00 | 11.00 | 9.50 to 12.00 |

**WIPING CLOTHS**—Jobbers' price per 1000 is as follows:

| | 13½ x 13½ | 13½ x 20½ |
|---|---|---|
| Cleveland | 52.00 | 58.00 |
| Chicago | 41.00 | 43.50 |

**SAL SODA** sells as follows per 100 lb.:

| | Current | One Month Ago | One Year Ago |
|---|---|---|---|
| New York | $1.75 | $1.75 | $1.75 |
| Philadelphia | 1.75 | 1.75 | 1.75 |
| Cleveland | 2.50 | 2.75 | 2.40 |
| Chicago | 2.00 | 2.00 | 2.00 |

**ROLL SULPHUR** in 360-lb. bbl. sells as follows per 100 lb.:

| | Current | One Month Ago | One Year Ago |
|---|---|---|---|
| New York | $3.65 | $3.65 | $4.30 |
| Cleveland | 3.875 | 3.62 | 4.60 |
| Chicago | 4.12½ | 4.125 | 4.00 |

**COKE**—The following are prices per net ton at ovens, Connellsville, and cover the past five weeks:

| | Sept. 18 | Sept. 11 | Sept. 4 | Aug. 27 | Aug. 21 |
|---|---|---|---|---|---|
| Prompt furnace | $4.60 | $4.75 | $4.75 | $4.00 | $3.90 |
| Prompt foundry | 6.00 | 5.50 | 5.50-6.25 | 5.50 | 5.50 |

**FIRE CLAY**—The following prices prevail:

| | | Current |
|---|---|---|
| Ottawa, bulk in carloads | per ton | $8.00 |
| Cleveland | 375-lb. bag | 2.50 |

**LINSEED OIL**—These prices are per gallon:

| | New York | | Cleveland | | Chicago | |
|---|---|---|---|---|---|---|
| | Current | One Year Ago | Current | One Year Ago | Current | One Year Ago |
| Raw in barrels (5 bbl. lots) | $2.15 | $1.90 | $2.50 | $2.10 | $2.37 | $2.05 |
| 5-gal. cans | 2.30 | 2.00 | 2.75 | 2.25 | 2.57 | 2.25 |

**WHITE AND RED LEAD**—Base price per pound:

| | Red | | | | White | |
|---|---|---|---|---|---|---|
| | Current | | 1 Year Ago | | Current Dry and In Oil | 1 Year Ago Dry and In Oil |
| | Dry | In Oil | Dry | In Oil | | |
| 100-lb. keg | 13.00 | 14.50 | 14.00 | 14.50 | 13.00 | 14.00 |
| 25 and 50-lb. kegs | 13.25 | 14.25 | 14.25 | 14.75 | 13.25 | 14.25 |
| 12½-lb. keg | 13.50 | 15.00 | 14.50 | 15.00 | 13.50 | 14.50 |
| 5-lb. cans | 15.00 | 16.50 | ..... | ..... | 15.00 | 16.00 |
| 1-lb. cans | 16.00 | 17.50 | ..... | ..... | 16.00 | 17.00 |

500 lb. lots less 10% discount; 2000 lb. lots less 10-2½% discount.

## Metal Working

### NEW ENGLAND STATES

**Conn., New Haven**—The New Haven Stove Repair Co., 488 State St., will build a 1 story 60 x 105 ft. garage. Estimated cost, $25,000. Noted Aug. 28.

**Conn., New Haven**—The Texas Oil Co., 17 Battery Pl., New York City, will build a 1 story, 40 x 56 ft. garage and a 1 and 2 story, 38 x 100 ft. office and storage building, on Forbes Ave., here. Estimated cost, $35,000.

**Conn., Waterbury**—The Manufacturers Foundry Co., Railroad Hill, has awarded the contract for the erection of a 1 story, 50 x 50 ft. shop, a 2 story, 50 x 120 ft. foundry and a 1 story, 100 x 100 ft. storage plant. Estimated cost, $60,000. Noted Sept. 18.

**Conn., West Haven** (New Haven P. O.)—The New Haven Machine Co., 179 Milford Turnpike, Allingtown, will build a 2 story, 44 x 100 ft. machine shop, here. Estimated cost, $25,000.

**Mass., Boston**—E. N. Weyner has awarded the contract for a 3 story, 60 x 175 ft. garage, to be erected at 1001 Commonwealth Ave. Estimated cost, $100,000.

**Mass., Dalton**—H. O. Bates & Sons, Dalton Garage, have awarded the contract for a 1 story, 68 x 125 ft. garage, to be erected on Main St. Estimated cost, $25,000.

**Mass., Great Barrington**—The Stanley Insulating Co., manufacturer of thermos bottles, plans to build a 2 story factory. Estimated cost, $35,000.

**Mass., Worcester**—The Coppus Engineering and Equipment Co., Park Ave., manufacturer of turbine blowers and pumps, has awarded the contract for the erection of a 1 story foundry. Estimated cost, $80,000. Noted Sept. 4.

**Mass., Worcester**—The J. W. Maguire Co., 745 Boylston St., is having plans prepared by Appleton & Stearns, Arch., 53 State St., Boston, for the erection of a garage on Park Ave. Estimated cost, $60,000.

**Mass., Worcester**—The Worcester Paper Box Co., 68 High St., will build a 2 and 4 story garage, to cover 36,000 sq.ft. floor space on Austin St. Estimated cost, $100,000. Noted Aug. 7.

**R. I., Auburn** (Providence P. O.)—The General Fire Extinguisher Co., West Exchange St., has awarded the contract for the erection of a 1 story, 55 x 120 ft. service station. Estimated cost, $25,000.

**Vt., Westminister Station**—The Abenaquet Machine Works have had plans prepared by the Cooley & Marvin Co., Engr., 711 Tremont Bldg., Boston, Mass., for the erection of a 1 story, 150 x 500 ft. machine shop. Estimated cost, $200,000.

### MIDDLE ATLANTIC STATES

**N. Y., New York** (Borough of Brooklyn)—F. Giovannetti, 228 De Graw St., will build a 1 story, 60 x 75 ft. garage on Hamilton Ave. and Center St. Estimated cost, $15,000.

**N. Y., New York** (Borough of Brooklyn)—D. Katz, Vandeveer and Jamaica Ave., will build a 1 story, 60 x 100 ft. garage. Estimated cost, $15,000.

**N. Y., New York** (Borough of Brooklyn)—R. Norek, c/o H. J. Nurick, Arch., 772 Broadway, will build a 1 story, 60 x 100 ft. garage, on Coney Island Ave. and Ave. P. Estimated cost, $15,000.

**N. Y., New York** (Borough of Manhattan)—J. Cohen, 243 Penn St., Brooklyn, will build a 1 story, 80 x 98 ft. garage at 233 West 25th St., here. Estimated cost, $40,000.

**N. Y., New York** (Borough of Manhattan)—W. M. Fleming, 612 5th Ave., will build a 2 story, 100 x 100 ft. garage at 226 East 55th St. Estimated cost, $35,000.

**N. Y., New York** (Borough of Manhattan)—The Hoover Letter Service, Inc., has had plans prepared by V. C. Farrar, Arch., 4 East 39th St., for alterations to its 5 story garage at 117 West 46th St. Estimated cost, $25,000.

**N. Y., New York** (Borough of Queens)—The Gehnrich Indirect Heat Oven Co., 60 Franklin Ave., Brooklyn, has awarded the contract for a 2 story factory, to be erected on Skillman Ave., Long Island City. Estimated cost, $300,000.

**Penn., Carbondale**—The Carbondale Machine Shop, Simpson St., has awarded the contract for the erection of a 1 story, 80 x 220 ft. machine shop. Estimated cost, $60,000.

**Penn., Philadelphia**—The Albro-Clem Elevator Co., D and Erie Sts., has awarded the contract for the erection of a 1 story, 78 x 118 ft. machine shop. Estimated cost, $13,000.

**Penn., Philadelphia**—T. S. Johnson & Sons, 622 Cherry St., plan to build a 2 story, 45 x 60 ft. factory, for the manufacture of roofing and sheet metal material and heating products.

**Penn., Philadelphia**—C. W. Miller, Morris Bldg., has awarded the contract for a 1 story, 50 x 200 ft. garage, to be erected on 49th and Market St. Estimated cost, $20,000. Noted Apr. 24.

**Penn., Philadelphia**—The Sharples Specialty Co., 23rd and Westmoreland St., manufacturer of separators, has awarded the contract for the erection of a 1 and 2 story, 75 x 180 ft. factory. Estimated cost, $65,000.

**Penn., Philadelphia**—J. W. Vandergrift, c/o Clark & Dudnick, Arch., Drexel Bldg., plans to build a 2 story, 57 x 175 ft. garage on 12th and Cambria St. Estimated cost, $50,000.

### SOUTHERN STATE

**N. C., Greensboro**—The McGlamery Automobile Co. has awarded the contract for a 2 story, 85 x 200 ft. garage, to be erected on Ashe St. Estimated cost, $140,000.

### MIDDLE WEST

**Ill., Chicago**—The W. R. Johnston Manufacturing Co., 359 East Ohio St., has acquired a 150 x 750 ft. site on Schubert and Fullerton Ave., and plans to build a factory, for the manufacture of patent windows. Estimated cost, $100,000.

**Ill., Chicago**—The Knight Light and Soda Fountain Co., 351 West Chicago Ave., has awarded the contract for a 1 story, 160 x 200 ft. and a 3 story, 77 x 210 ft. factories, to be erected on Kildare and Schubert Ave., for the manufacture of soda fountains. Estimated cost, $200,000.

**Ill., Moline**—The Moline Iron Works have awarded the contract for the erection of a 1 story, 110 x 360 ft. and a 110 x 400 ft. factory. Estimated cost, $200,000.

**Mich., Bay City**—J. P. Beck, c/o the Beck Automobile Co., 201 South 2nd St., Saginaw, is having plans prepared by R. E. Bickel, Arch., Bay City, for a 3 story, 100 x 100 ft. garage, store room and office, to be erected on Washington St., here. Estimated cost, 60,000. Noted Aug. 28.

**Mich., Detroit**—The Monarch Foundry Co., 895 Greenwood Ave., will build a 100 x 200 ft. grey iron foundry on Herrick St. and Vernor Ave. H. M. Lane Co., 701 Owen Bldg., Engr. Noted Sept. 18.

**Mich., Detroit**—The O & S Bearing Co., 214 Artillery Ave., has awarded the contract for the erection of a 1 story, 40 x 50 ft. factory. Estimated cost, $10,000.

**Mich., Detroit**—The Packard Motor Car Co., West Grand Blvd., has awarded the contract for the erection of a 1 story, 241 x 446 ft. and a 3 story, 80 x 225 ft. additions to its plant. Noted July 10.

**Mich., Detroit**—The Paige-Detroit Motor Car Co., McKinstry and Fort St., W., will build a 1 story, 275 x 528 ft. factory. A. Kahn, Marquette Bldg., Arch.

**Mich., Filer City**—The Manistee Drop Forge Co., Manistee, has purchased a site, here, and plans to build a plant.

**Mich., Port Huron**—The Chief Motor Co. has purchased a 10 acre site on Elmwood St., and plans to build a plant for the manufacture of automobile engines.

**Ohio, Akron**—The Firestone Steel Products Co., Miller and Sweitzer St., has awarded the contract for the erection of a 1 story, 100 x 200 ft. factory, for the manufacture of rims. Estimated cost, $500,000.

**Ohio, Cleveland**—The American Automobile Trimming Co., 864 East 72nd St., plans to build a 5 story, 104 x 328 ft. factory, on Taft Ave. Estimated cost, $100,000.

**Ohio, Cleveland**—The F. H. Boltman Co., 10271 Berea Rd., has purchased a site and plans to build a 1 story, 84 x 112 ft. machine shop. Estimated cost, $30,000.

**Ohio, Cleveland**—The Brown Body Corporation, East 32nd St. and Superior Ave., manufacturer of automobile bodies, has purchased a site on Maywood Ave., and plans to build a 5 story, 100 x 140 ft. factory. Estimated cost, $500,000.

**Ohio, Cleveland**—The R. F. Carpenter Manufacturing Co., 984 East 64th St., manufacturer of metal doors and partitions, will build a 1 story, 60 x 100 ft. addition to its plant. Estimated cost, $20,000.

**Ohio, Cleveland**—The Cleveland Hardware Co., 3840 East 79th St., will build a 1 story, 40 x 100 ft. factory. Estimated cost, $25,000.

**Ohio, Cleveland**—The Cleveland Twist Drill Co., 4727 Hamilton Ave., plans to build a 1 story, 67 x 114 ft. forge shop. Estimated cost, $20,000.

**Ohio, Cleveland**—The Cream Cone Machinery Co., 5454 Hough Ave., will build a 2 story, 54 x 54 ft. factory at 5808 Hough Ave. Estimated cost, $30,000.

**Ohio, Cleveland**—The Fink Body and Fender Co., 2075 East 65th St., is having plans prepared for the erection of a 2 story, 62 x 101 ft. factory and repair shop. Estimated cost, $60,000.

**Ohio, Cleveland**—F. A. Foyer, Schofield Bldg., is having plans prepared by G. S. King, Arch., Permanent Bldg., for a 6 story, 88 x 95 ft. garage and sales room, to be erected at 1341 Chestnut St. Estimated cost, $50,000.

**Ohio, Cleveland**—The Geometric Stamping Co., 209 East 131 St., will build a 1 story, 31 x 79 ft. factory. Estimated cost, $10,000.

**Ohio, Cleveland**—The P. A. Gier Co., 5113 St. Clair Ave., manufacturer of electrical appliances, plans to build a 2 story, 24 x 39 ft. addition to its plant. Estimated cost, $20,000.

**Ohio, Cleveland**—The Great Lakes Copper Co., Trumbull Ave., has purchased a site and plans to build a 1 story, 80 x 130 ft. factory. Estimated cost, $40,000.

**Ohio, Cleveland**—M. Hinkle, 817 Prospect Ave., has leased a site on East 20th St., and plans to build a 2 story, 120 x 125 ft. garage and sales room. Estimated cost, $75,000.

**Ohio, Cleveland**—The Holam Manufacturing Co., 4011 Clark Ave., manufacturer of light metal stamping products, has awarded the contract for a 2 story, 80 x 116 ft. factory, to be erected at 3809 Clark Ave. Estimated cost, $40,000.

**Ohio, Cleveland**—The Lang Body Co., 3088 West 106th St., manufacturer of automobile bodies, plans to build a 4 story, 180 x 190 ft. addition to its plant. Estimated cost, $100,000.

**Ohio, Cleveland**—S. Levin, 2407 East 46th St., has leased a site on Warren Rd., and plans to build a 2 story, 116 x 139 ft. garage. Estimated cost, $50,000.

**Ohio, Cleveland**—L. Malewitz, Waterloo Rd., plans to build a 2 story, 75 x 90 ft factory, for the manufacture of metal stamping products. Estimated cost, $30,000.

**Ohio, Cleveland**—The Ohio Foundry Co., 9806 Quincy Ave., has awarded the contract for the erection of a 1 story, 49 x 49 ft. addition to its plant. Estimated cost, $10,000.

**Ohio, Cleveland**—The White Motor Car Co., East 79th St., will build a 2 story, 210 x 884 ft. machine shop. Estimated cost, $175,000. The company is also having plans prepared for a 1 story, 200 x 600 ft addition to its factory. Estimated cost, $600,000.

**Ohio, Columbus**—The Columbus Oldsmobile Co., 134 Gay St., will build a 2 story, 63 x 183 ft. garage. Estimated cost, $60,000. W. S. Ferguson Co., 1900 Euclid Ave., Cleveland, Engr.

**Ohio, Dayton**—The Dayton Pipe Coupling Co. has awarded the contract for a 1 story, 90 x 120 ft. machine and forge shop, to be erected on Edmund St. Estimated cost, $50,000.

**Ohio, Delphos**—The American Road Machinery Co. has had plans prepared for the erection of an addition to its plant. Estimated cost, including equipment, $300,000.

**Ohio, Wooster**—The Buckeye Aluminum Co. is having preliminary plans prepared for the erection of a factory. Estimated cost, $125,000.

**Wis., Edgerton**—The Continental Axle Co. will build a 2 story, 60 x 275 ft. factory, on Main St. Estimated cost, $50,000.

**Wis., Ft. Atkinson**—The James Manufacturing Co., manufacturer of stanchions and dairy supplies, is having plans prepared by J. G. Shodion, Engr., Fort Atkinson, for the erection of a 1 story, 400 x 500 ft. factory. Estimated cost, $100,000.

**Wis., Sheboygan**—The Globe Foundry Co., 9th St., plans to build a 2 or 4 story, 60 x 250 ft. foundry, on 18th and Wiedwood St. Estimated cost, $60,000.

### WEST OF THE MISSISSIPPI

**Iowa, Manning**—F. D. Ross & Co. has awarded the conrtact for the erection of a 1 story, 90 x 150 ft. garage. Estimated cost, $65,000.

**Mo., St. Louis**—The American Brake Co., 1926 North 2nd St., has awarded the contract for the erection of a 4 story, 130 x 150 ft. factory. Estimated cost, $225,000.

**Mo., St. Louis**—The Landis Machine Co., 1515 North 25th St., manufacturer of shoe and harness machinery, has awarded the contract for a 4 story factory, to be erected on 2nd and Gano St. Estimated cost, $245,000.

**Okla., Muskogee**—O. T. Graham, 16th St. and Emporia Ave., has had plans prepared by H. O. Valeur & Co., 705 Phoenix Bldg., Arch., for a 1 story, 100 x 100 ft. garage. Estimated cost, $50,000.

### WESTERN STATES

**Calif., Los Angeles**—The Standard Oil Co., 1727 North Spring St., has awarded the contract for the erection of a 1 story machine shop and garage. Estimated cost, $63,000.

**Calif., Pasadena**—The Warnerlite Co., 45 South Raymond Ave., is having plans prepared by Shepherd & Hamm, Arch., Central Bldg., for a 1 story, 80 x 100 ft. administration building with two 60 x 80 ft. wings, and a 1 story, 260 x 300 ft. factory, to be erected on Marengo Ave., for the manufacture of automobile lighting appliances. Estimated cost, $100,000. Noted Aug. 21.

**Calif., San Francisco**—The Simmons Co., 198 Bay St., manufacturer of brass and iron beds, has awarded the contract for a 135 x 278 ft. factory, to be erected on Stockton and Bay St. Estimated cost, $100,000.

**Ore., Corvallis**—The Whiteside & Locke Hardware and Implement Co. has purchased a site on 3rd and Madison St., and plans to build a 2 story, 50 x 100 ft. addition to its plant. Estimated cost, $50,000.

**Ore., Enterprise** — Nazarene College, Nampa, Idaho, plans to build a manual training shop, here. Estimated cost, $5000.

**Ore., Myrtle Point**—L. H. Pearce has purchased a site and plans to build a 1 story, 90 x 100 ft. addition to his garage. Estimated cost, $50,000.

### CANADA

**Ont., Guelph**—Brown & Little, 23 Cork St., are having plans prepared by P. H. Secords & Sons, Ltd., Engr., 133 Nelson St., Brantford, for a 2 story, 82 x 160 ft. garage, to be erected on Eramosa St. Estimated cost, $60,000.

**Que., Cap de la Madeleine**—The Tidewater Shipbuilders, Ltd., Three Rivers, will build a 2 story, 40 x 62 ft. machine shop, on the river front, here. Estimated cost, $50,000. M. Mapes, c/o Canadian Pacific R. R., Windsor St., Montreal, Arch.

## General Manufacturing

### NEW ENGLAND STATES

**Conn., Bridgeport**—The Peoples Ice and Cold Storage Co., 1335 Seaview Ave., has awarded the contract for the erection of a 7 story, 100 x 150 ft. cold storage plant, a 1 story, 65 x 100 ft. and 60 x 65 ft. warehouse. Estimated cost, $350,000. Noted Sept. 18.

**Conn., New Haven**—Alper, Krall & Co., 44 Crown St., manufacturer of hats, will build a 4 story, 83 x 100 ft. factory, on Greene and Olive St. Estimated cost, $75,000. Brown & Von Beren, 185 Church St., Arch.

**Conn., West Haven** (New Haven P. O.)—The Connecticut Fat Rendering and Fertilizer Co., Front Ave., has awarded the contract for the erection of a rendering plant. Estimated cost, $25,000.

**Mass., Thorndike**—The Thorndike Co., manufacturer of sheetings, has awarded the contract for the erection of a 6 story, 75 x 163 ft. mill. Estimated cost, $175,000. Noted Sept. 18.

**R. I., Pawtucket**—The Ervma Weaving Co., 30 Bayley St., has awarded the contract for a 1 story, 90 x 114 ft. weave shed, to be erected on Privet St. Estimated cost, $30,000.

**R. I., Providence**—The L. L. Fales Corporation, c/o T. J. H. Pierce, Arch., 77 Washington St., will build a 2 story factory for the manufacture of carriages and a paint shop, on Washington, Fountain and Dean St. Estimated cost, $30,000.

**R. I., Providence**—The General Baking Co., 207 Brook St., is having plans prepared by J. E. Byrne, Arch., 45 East 17th St., New York City, for an addition to its plant, to be erected on John and William St. Estimated cost, $150,000. Noted Aug. 7.

**R. I., Riverpoint**—The Royal Mills plan to remodel their spinning mill and build a 3 story, 150 x 500 ft. weave shed. Estimated cost, $500,000.

### MIDDLE ATLANTIC STATES

**Md., Baltimore**—The Maryland Casualty Co., Baltimore and Fayette St. and Guilford Ave., plans to build a printing plant, in conection with business buildings and a community settlement, to be erected on 40th St. and Cedar Ave. and 37th St. and Elm Ave. Total estimated cost, $3,000,000. O. G. Simonson, Maryland Casualty Tower, Arch.

**N. J., Trenton**—The Keystone Wood Co., Perrine Ave., has awarded the contract for the erection of a 1 story, 50 x 150 ft. addition to its plant. Estimated cost, $20,000. Noted May 15.

**N. Y., Hempstead**—The Borden Farms Products Co., Main St., has awarded the contract for the erection of a 1 story, 30 x 180 ft. distributing plant.

### SOUTHERN STATES

**La., Winnfield**—The Winn Parish Lumber Co., Shreveport, plans to build a lumber mill here. Estimated cost, $500,000. J. S. Welsh, Secy.

**N. C., Southport**—The Cape Fear Fish Fertilizer Co plans to build a 1 story, 125 x 300 ft. fertilizer plant. Estimated cost, $250,000.

**N. C., Statesville**—The Statesville Coca Cola Co. has awarded the contract for the erection of a 2 story, 50 x 90 ft. bottling plant. Estimated cost, $200,000.

### MIDDLE WEST

**Ill., Chicago**—The Illinois Publishing Co., Hearst Bldg., plans to build a 2 story, 25 x 180 ft. addition to its press room and office, at 316 West Madison St. Estimated cost, $100,000. P. Gerhardt, 64 Randolph St., Arch.

**Ill., Hardin**—The Standard Oil Co., Syndicate Trust Bldg., St. Louis, Mo., has had plans prepared for an oil service station, to be erected here. Estimated cost, $30,000.

**Ind., Fort Wayne**—Thieme Bros. Co., Park Ave., manufacturer of silk, has awarded the contract for a factory, to be erected on Runnion and Morrison Ave. Estimated cost, $187,000. Noted May 29.

**Mich., Detroit**—The Mills-Fox Baking Co., 4th St. and Merrick Ave., will build a 2 story, 65 x 100 ft. addition to its plant. Estimated cost, $30,000. Brown & Preston, 406 Empire Bldg., Arch.

**Mich., Detroit**—The National Oxygen Co., 176 Oakland Ave., is having plans prepared by Brown & Preston, Arch., 406 Empire Bldg., for alterations and a 1 story, 40 x 122 ft. addition to its plant. Estimated cost $10,000.

**Mich., Detroit**—The Tivoli Brewing Co., 1555 Mack Ave., will build a 2 story, 60 x 100 ft. bottling plant. Mildner & Eisen, 924 Hammond Bldg., Arch.

**Mich., Flint**—The Champion Ignition Co. will build a 3 story, 108 x 178 ft. plant, for the manufacture of porcelain ignition parts and spark plugs.

**Mich., Menominee**—The Lloyd Manufacturing Co. has had plans prepared for the erection of a 3 story, 100 x 400 ft. factory and loom for the manufacture of baby carriage bodies.

**Ohio, Cleveland**—The Cleveland and Sandusky Brewing Co., American Trust Bldg., plans to build a 2 story, 100 x 170 ft. addition to its bottling plant on East 55th St. Estimated cost, $100,000.

**Ohio, Cleveland**—The Federal Packing Co., East 4th St., has leased a site and plans to build a 4 story, 40 x 115 ft. cold storage plant. Estimated cost, $100,000.

**Ohio, Cleveland**—The Pioneer Manufacturing Co., East 103rd St. and Harvard Ave., manufacturer of dust absorbing products, oil and paint specialties, has leased a site at 3053 East 82nd St. and plans to build a 2 story, 170 x 200 ft. factory. Estimated cost, $50,000.

**Ohio, Kent**—The Mason Tire and Rubber Co. has awarded the contract for a 2 story, 80 x 120 ft. addition to its plant, to be erected on Erie St. Estimated cost, $60,000. Noted July 24.

**Ohio, Mount Vernon**—The Knox Tire and Rubber Co. is having plans prepared by the Osborn Engineering Co., 2848 Prospect Ave., Cleveland, for the erection of a 2 story, 90 x 200 ft. factory and office. Estimated cost, $100,000.

**Ohio, Urbana**—The Urbana Packing Co. has awarded the contract for the erection of a 2 story, 30 x 75 ft. and 30 x 60 ft. cold storage plant and power house. Estimated cost, $30,000.

**Wis., Chilton**—The Aluminum Specialty Co., 17th and Wollymer St., has awarded the contract for a 2 story, 60 x 200 ft. factory, to be erctd on Main St. Estimated cost, $75,000. Noted Sept. 11.

**Wis., Lena**—A. Mallien plans to build six 2 story, 40 x 130 ft. cheese factories on Main St. Estimated cost, $55,000.

**Wis., Milwaukee**—The Edmonds Realty Co. has awarded the contract for the erection of a 1 story, 135 x 475 ft. factory, for the Edmonds Shoe Co., Burleigh and Weil St., Lessee. Estimated cost, $275,000.

**Wis., Sheboygan**—The Crocker Chair Co., North 8th St., has awarded the contract for a 3 story, 60 x 140 ft. factory, to be erected on Virginia Ave. Estimated cost, $23,500. Noted Sept. 11.

### WEST OF THE MISSISSIPPI

**Iowa, Waverly**—The Iowa Sugar Co. plans to build a 3 story, 50 x 100 ft. pulp mill and a 3 story, 50 x 100 ft. warehouse. Estimated cost, $700,000.

**Mo., St. Louis**—The Certain-teed Products Corporation, Boatmen's Bank Bldg., has had plans prepared by Klipstein & Rathman, Arch., Chemical Bldg., for a 4 story factory, to be erected on Union Ave., for the manufacture of paint. Estimated cost, $100,000.

**Mo., St. Louis**—The Koken Barber Supply Co., 2500 Texas Ave., manufacturer of chemicals and drugs, plans to alter and build an addition to its factory. Estimated cost, $5000.

**Mo., Springfield**—The Springfield Furniture Co., Pine St. and the Boulevard, has awarded the contract for the erection of a 5 story, 80 x 150 ft. factory. Estimated cost, $100,000.

**Neb., Omaha**—J. and A. McDonald, 908 Omaha National Bank Bldg., have awarded the contract for a 7 story, 118 x 132 ft. addition to their factory, to be erected on 13th St. and Capitol Ave., for the manufacture of biscuits. Estimated cost, $200,000.

**Neb., Omaha**—The Omaha Flour Mills Co., 820 First National Bank Bldg., plans to build a 7 story addition to its flour mill. Estimated cost, $600,000.

### WESTERN STATES

**Ariz., Phoenix**—The Arizona Fruit and Storage Co. is having plans prepared by Shepherd & Hamm, Arch., Central Bldg., Pasadena, Calif., for the erection of a 90 x 160 ft. packing plant. Estimated cost, $50,000.

**Calif., Chino**—Libby, McNeil & Libby, 38 South Dearborn St., Chicago, Ill., has purchased the cannery, here, and plans to build a 2 or 3 story addition. Estimated cost, including equipment, $250,000.

**Calif., Exeter**—Hunt Bros., c/o W. J. Miller, Arch., 417 Market St., San Francisco, are having plans prepared for alterations to their canning plant here.

**Calif., Long Beach**—The Trident Packing Co. will take over the plant of the Pacific Co., and plans to build several additions to the same. Estimated cost, $50,000.

**Calif., Los Gatos**—Hunt Bros., c/o W. J. Miller, Arch., 417 Market St., San Francisco, are having plans prepared for alterations to their canning plant, here.

**Calif., San Jose**—Hunt Bros., c/o W. J. Miller, Arch., 417 Market St., San Francisco, are having plans prepared for alterations to their canning plant, here.

**Ore., Enterprise**—The Eastern Oregon Lumber Co. plans to rebuild its saw mill which was recently destroyed by fire. About $50,000. Address J. Ricker.

**Ore., Portland**—The Royal Bakery Co., 441 Everett St., has awarded the contract for a 1 story, 70 x 90 ft. and a 2 story, 16 x 44 ft. additions to its plant, to be erected on Vancouver Ave. and Ivy St. Estimated cost, $50,000.

**Wash., Fairview**—(Seattle P. O.)—The A. Kristoferson Co., East Lake Ave., plans to build a 2 story, 100 x 100 ft. milk plant, to include a refrigeration plant. Estimated cost, $50,000. E. Story, New York Blk., Seattle, Arch.

**Wash., Leavenworth**—The Pelshastin Lumber Co. plans to rebuild its saw mill and factory, which were recently destroyed by fire. Estimated cost, $75,000.

### CANADA

**B. C., New Westminster**—The Western Cordage Co., 402 Pender St., W., Vancouver, plans to build a factory near Brunette River, here, to consist of several 1 story buildings. Estimated cost, $80,000. Sharp & Thompson, 905 London Bldg., Vancouver, Arch.

**Ont., Cornwall**—The Firestone Tire and Rubber Co., South Main St., Akron, Ohio, plans to build a factory, here. Estimated cost, $200,000.

**Que., Montreal**—W. C. MacDonald Rees, Ontario St., has awarded the contract for the erection of a 4 story, 50 x 75 ft. factory, for the manufacture of tobacco. Estimated cost, $70,000.

**Sask., Melville**—The Saskatchewan Co-Operative Creamery Co., Regina, will build a 3 story, 47 x 50 ft. creamery. Estimated cost, $60,000. Poole Constr. Co., Smith St., Arch.

## Machine Tools Wanted

**The following concerns are in the market for machines and machine tools.**

**Mass., East Walpole**—Bird & Son, Inc. —lathe. 20 to 24 in., 150 ft. between centers; advertised in the "Searchlight Section."

**N. J., Hoboken**—The Union Iron Works, 567 Newark St.—an 8 ft. or larger vertical boring and turning mill (used).

**N. Y., Little Falls**—The H. P. Snyder Manufacturing Co., West Main St.—a No. 75½ Bliss geared press (new).

**N. Y., New York** (Borough of Bronx)—The Automatic Wire Goods Manufacturing Co., 13 Canal Pl., is interested in manufacturers of wood working machinery.

**N. Y., New York** (Borough of Manhattan)—Amplex, Inc., 6 West 32nd St., is interested in manufacturers of watch chain machinery for gold or filled watch chains. R. C. Thompson, Asst. Secy.

**N. Y., New York,** (Borough of Manhattan)—W. A. Dodge, 95 Liberty St.—1 No. 31 horizontal boring mill, Lucas or similar machine of Universal type; 1 No. 00 B&S automatic screw machine, 2 or 2½ in.; 1 Cleveland screw machine, model A and Waterbury Farrel foundry presses, 36 in. between housings and about 6 x 30 in. hole in bed plate.

**N. Y., New York** (Borough of Manhattan)—The Indicating Calipers Co., 506 East 19th St.—a surface grinder, using cup shaped wheel, 6 to 8 in. diameter; advertised in the "Searchlight Section."

**N. Y., New York** (Borough of Manhattan)—The Peerless Iron Pipe Exchange, Inc., 302 Broadway—several pipe cutting and threading machines from ⅛ to 12 in.

**N. Y., Whitestone**—J. Donoghue—2 No. 60 Heald cylinder grinders; advertised in the "Searchlight Section."

**Penn., Erie**—The American Boiler Works, State and Front St.—a power punch.

**Penn., Philadelphia**—The Monarch Machinery Co., 300 North 3rd St.—one crank shaft grinding machine for 6 cylinder shafts and 1 No. 23 B. D. Whitney cylinder grinder.

**Penn., Wilkesbarre**—The International Fabricating Corporation — LeBlond or American 24 in. x 10 ft. heavy duty crank shaft lathes X; a 36 in. Bullard vertical turret lathe, New Era type and 3 x 36 in. Jones & Lamson flat turret lathes.

No. 3B and No. 4B Brown & Sharpe heavy duty plain milling machines.

One Norton 10 x 72 in. heavy duty plain; one 16 x 50 in. heavy duty double head, for crank shaft pin grinding and No. 60 Heald internal cylindrical grinding machines.

One No. 615 Fellow spur and spiral gear shaper.

One Carwin or Norton crank shaft balancing machine.

One 36 in. Cincinnati Bickford heavy duty upright drill; advertised in the "Searchlight Section."

**Ill., Chicago**—The E. L. Essley Machinery Co., 555 West Washington St.—a Fellows gear shaping machine for internal gears and several Hurlbut-Rogers cutting-off machines with accelerating feed (new).

**Ill., Chicago**—The Illinois Steel Co., 208 South La Salle St.—a motor-driven power hammer for forging up to 5 in. stock (new).

**Ill., Chicago**—A. C. Torbert, 208 South La Salle St.—locomotive cranes and steam shovels.

**Ill., Cicero**—The Fulton Saw Works, 52nd Ave. and 22nd St.—a 7 in. sticker for woodworking (new).

**Mich., Detroit**—The City Police Department, Headquarters Bldg.—1 elevator conveyor, equipped with reversing motor, minimum capacity of 2,000 boxes per hour.

**Mich., Detroit**—The General Ice Delivery Co., Grand River Ave.—an ice handling conveyor.

**Mich., Detroit**—The Monarch Foundry Co., 895 Greenwood Ave.—a traveling crane and foundry equipment.

**Mich., Menominee**—The Lloyd Manufacturing Co.—specially designed looms and an overhead trolley system.

**Mich., Menominee**—The Wolverine Paper Box Co.—a power press to puch 1 x .475 in. notches in 16 gauge sheets; a power press to punch ¼ in. holes on 2 thicknesses of 16 gauge metal; a 50 in. squaring shear to cut to gauge metal; a riveting machine and a hydraulic veneering press (new).

**Mich., Ypsilanti**—The Crown Fender Co. —presses.

**Ohio, Canton**—The Canton Chaplet and Manufacturing Co., Inc., 3rd St. and Rex Ave., is interested in manufacturers of upsetting and heading machines.

**Ohio, Cleveland**—The Guide Motor Lamp Co., 11400 Madison Ave.—a lathe up to 36 in. (used).

**Mich., Detroit**—The Tivoli Brewing Co.; 1555 Mack Ave.—bottling machinery and bottle washers.

**Wis., Fairchild**—The Wisconsin Canned Food Co., c/o W. F. Hood—canning machinery.

**Wis., Sheboygan**—The Crocker Chair Co. —wood-working machines.

**Iowa, Des Moines**—The Century Lumber Co., 713 Mulberry St., is interested in manufacturers of cement sack cleaning machines. E. Weitz, Secy.

**Minn., Albert Lea**—The American Gas Machine Co.—a No. 00 Brown & Sharp automatic screw machine (new or used).

**Mo., St. Louis**—The Certain-teed Products Corporation, Boatmen's Bank Bldg. —paint grinding machinery.

**Mo., St. Louis**—The Landis Machine Co., 1515 North 25th St.—machine tools for the manufacture of shoe and harness machinery.

**Neb., Omaha**—The Omaha Flour Mills Co., 820 First National Bank Bldg.—sifters, rolls, aspirators, cleaners and other equipment.

**Ariz., Chandler**—The Board of Education —manual training equipment.

**Utah, Salt Lake City**—W. E. Carnell, 58 South 1st West St.—a 4 ft. plain radial drill; a No. 2 B&S universal grinder and a 20 or 24 in. back geared shaping machine (used).

**Ont., Walkerville**—The General Motors Corporation—$3,000,000 worth of machinery for the manufacture of automobiles.

*You don't get the most out of this paper—*

unless you read the

*"SEARCHLIGHT SECTION"*

Don't fail to do so. It's the "Opportunity" section of the machinery field.

**For every business want**

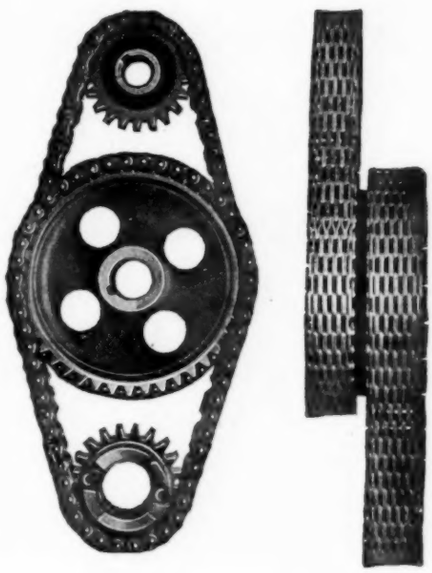
**"Think SEARCHLIGHT First"**

See Pages 300 to 324

See Pages 300 to 324

May, 1919

# WAR RECORD NOT MADE PUBLIC



## The "Whitney" Special Quality "Type M" Chains

made a great showing during the war years 1916—1917 and 1918.

Our tests and demonstrations were made on prominent 8-cylinder motors in service on a large number of cars owned in the State of Connecticut.

During this long period not a single "Whitney" Chain or Sprocket had to be replaced and the condition of every Drive has been pronounced remarkable.

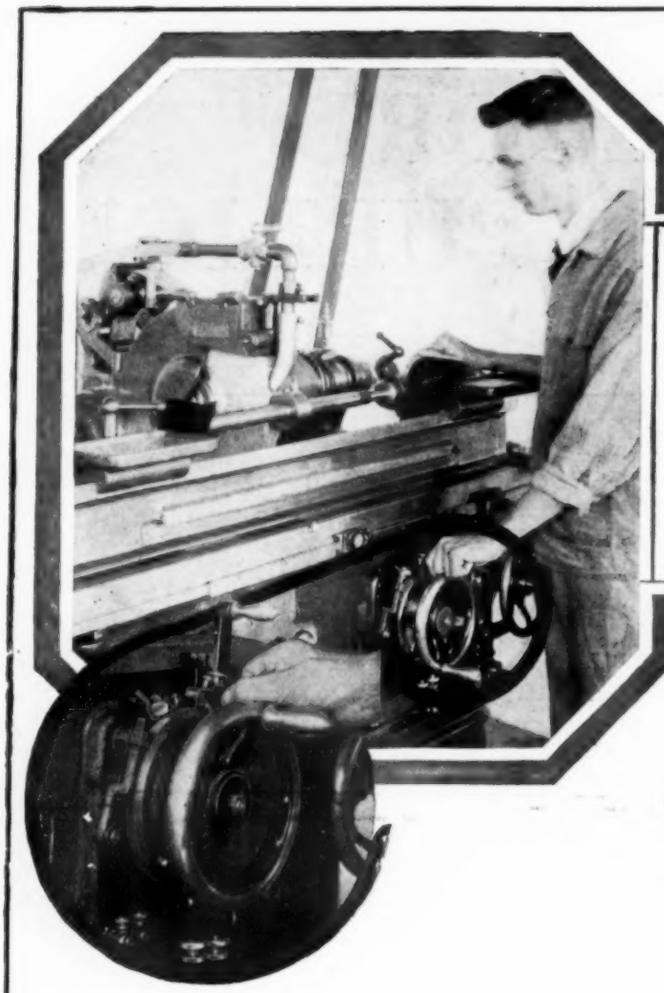
One drive recently examined had given over 35,000 miles' service and both Chains and Sprockets were in such perfect condition that they appeared good for more than double that record (Sprockets having no adjustment).

The links of this SPECIAL CHAIN have finished faces and reamed holes, and the smooth faces do not damage the Sprocket teeth.

Our war contracts were such that we did not announce this SPECIAL CHAIN until after the conflict was over.

## The Whitney Mfg. Co.

**Hartford, Conn.**



# Removing the Stock by Quarter Thousandths

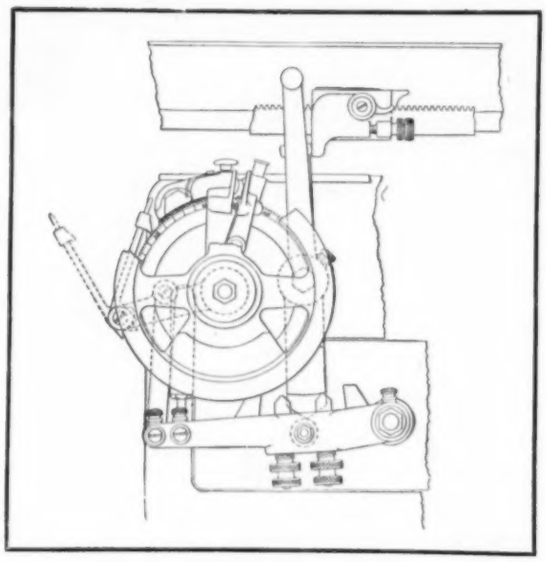
**1/12th of the thickness of tissue paper**
**This is the distance the Wheel Slide moves**
**In reducing the diameter of the work one-quarter of one-thousandth**

This is accuracy and is one of the capabilities of

## BROWN & SHARPE Grinding Machines

The Automatic feed shown is of great value where it is necessary to have the table traversing in conjunction with the feeding of the wheel to the work. It can be set to grind any amount, automatically becoming disengaged when the piece reaches the exact size. This arrangement ordinarily permits the operator to look after at least two machines.

If it is desired to use the ratchet feed by hand, there is a latch which is pinched once for every quarter of one-thousandth to be removed, as shown in the upper photographs. The many styles and sizes that our stock includes are shown in our catalog. It will interest you. Send for it today.



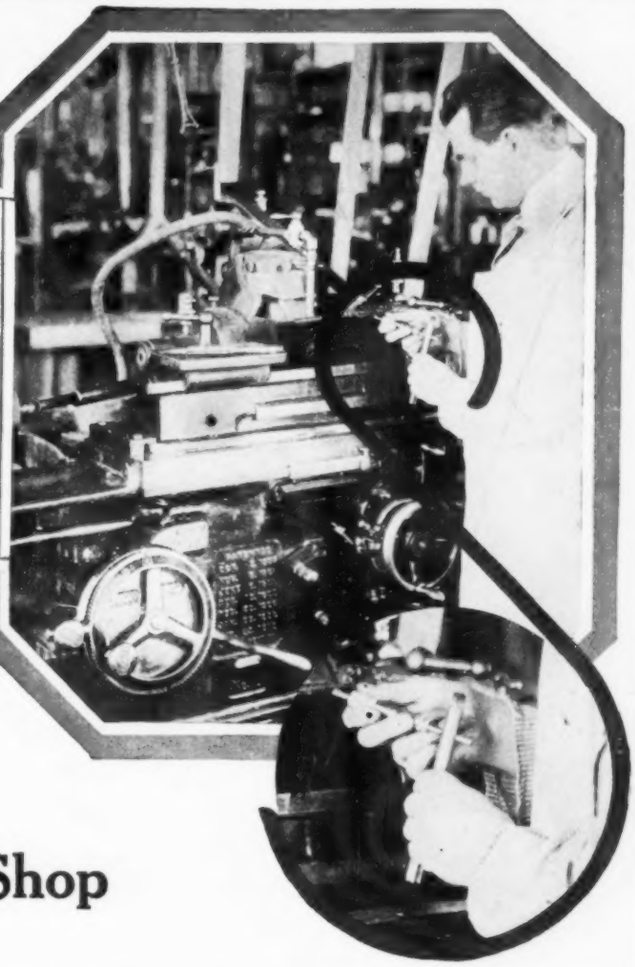
REPRESENTATIVES IN U. S. A.:
BALTIMORE, MD.....Carey Machinery & Supply Co.
CINCINNATI, O., INDIANAPOLIS, IND.,
The E. A. Kinsey Co.
SAN FRANCISCO, CAL.....Pacific Tool & Supply Co.
CLEVELAND, O., DETROIT, MICH.,
Strong, Carlisle & Hammond Co.
ST. LOUIS, MO...Colcord-Wright Machy. & Supply Co.
SEATTLE, WASH.....Perine Machinery Co.
PORTLAND, ORE.....Portland Machinery Co.
ST. PAUL, MINN.....Savage & Winter Co.
ATLANTA, GA.....Seeger Walraven Co.

## Brown & Sharpe

**Providence, R. I.**

OFFICES:
CHICAGO, ILL.....629-630 Washington Blvd.
PHILADELPHIA, PA.....1103-1105 Liberty Bldg.
PITTSBURGH, PA.....2538 Henry W. Oliver Bldg.

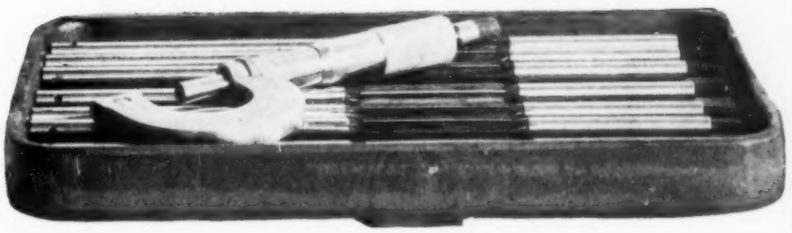
# When the Grinding Limits Are Close



## Reliable Tools For the Operator Produce Quality Work for the Shop

The operator or shop that is equipped with

**Brown & Sharpe Machinists' Tools**



is capable of producing high grade quality work.

The operator pictured here knows at every stage of the grinding the amount of stock to be removed. There is no guesswork. He not only knows whether it's over or under but "*How much it is either way.*"

Methods of this character develop skilled operators and produce quality work for the shop.

*Send for Catalog 27 and acquaint yourself with*
**BROWN & SHARPE PRECISION TOOLS**
*"The choice of machinists for three generations."*

# Manufacturing Co.

**R. I., U. S. A.**

**BROWN & SHARPE OF NEW YORK, Inc.**
*Offices:* 20 Vesey St.
Rochester, 415 Chamber of Commerce Bldg.
Syracuse.....Room 419, University Block

REPRESENTATIVES IN CANADA:
CANADIAN FAIRBANKS-MORSE CO., LTD., Montreal, Toronto, Winnipeg, Calgary, Vancouver, St. John, Hamilton.
REPRESENTATIVE IN AUSTRALIA:
R. L. Scrutton & Co., Ltd., Sydney, N.S.W.

BUTTERFIELD—

# U. S. Standard

We call particular attention to the fact that we fill orders with U. S. Standard Threads unless otherwise specified. The increasing demand for this thread has made this imperative.

Designers and manufacturers of screws, bolts and nuts recognizing its superiority in design and operation are gradually adopting this thread wherever threads are used.

Recognizing their durability and dependability in giving them the thread they want, manufacturers everywhere are gradually adopting Butterfield taps and dies to cut their United States standard threads. In short Butterfield taps and dies are becoming the United States standard thread cutting tools.

**Butterfield taps and dies** are the result of the refinements gained from the experience of 35 years of painstaking manufacture and universal usage.

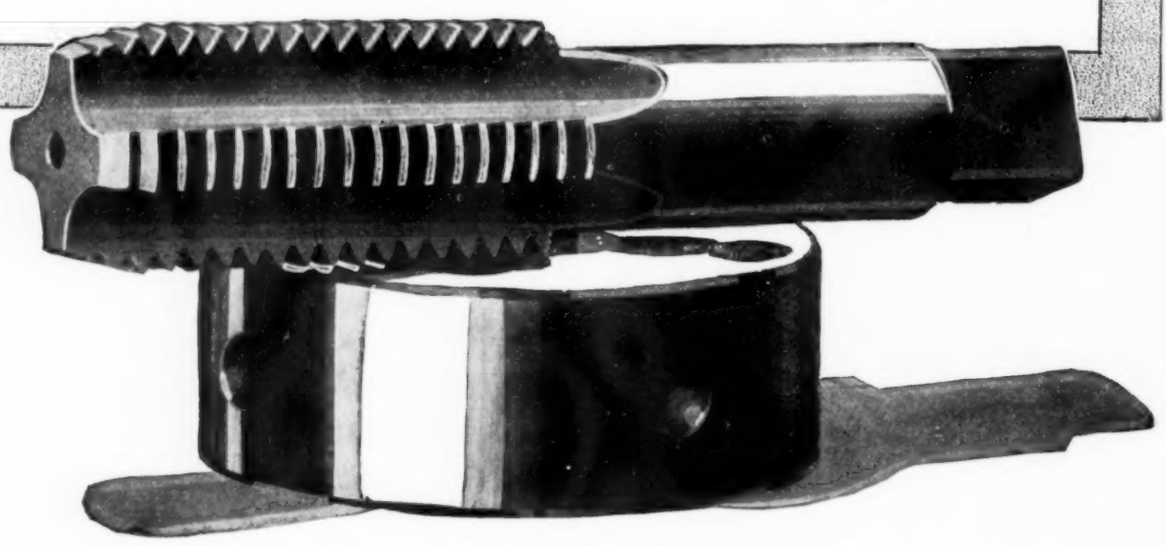
***Send for our Catalog Number Seventeen. It contains complete information about our products and in addition 25 pages of information about threads and threading. A useful reference book for the shop library.***

## Butterfield & Company

**Derby Line, Vermont, U. S. A.**

**New York Store—62 Reade Street. Canada—Rock Island, Quebec. Detroit Store—W. J. Baird Mchy. Co. Chicago—11 S. Clinton Street.**

Metal and Hardware Products, Ltd., 104 High Hoborn, London, W. C., England. Fenwick, Freres & Co., 8 Rue de Rocroy, Paris, France. Ab-Sigfr. Anderson & Co., Malmo, Sweden. Leslie & Company Perth, West Australia.



# To cut down the cost per cut

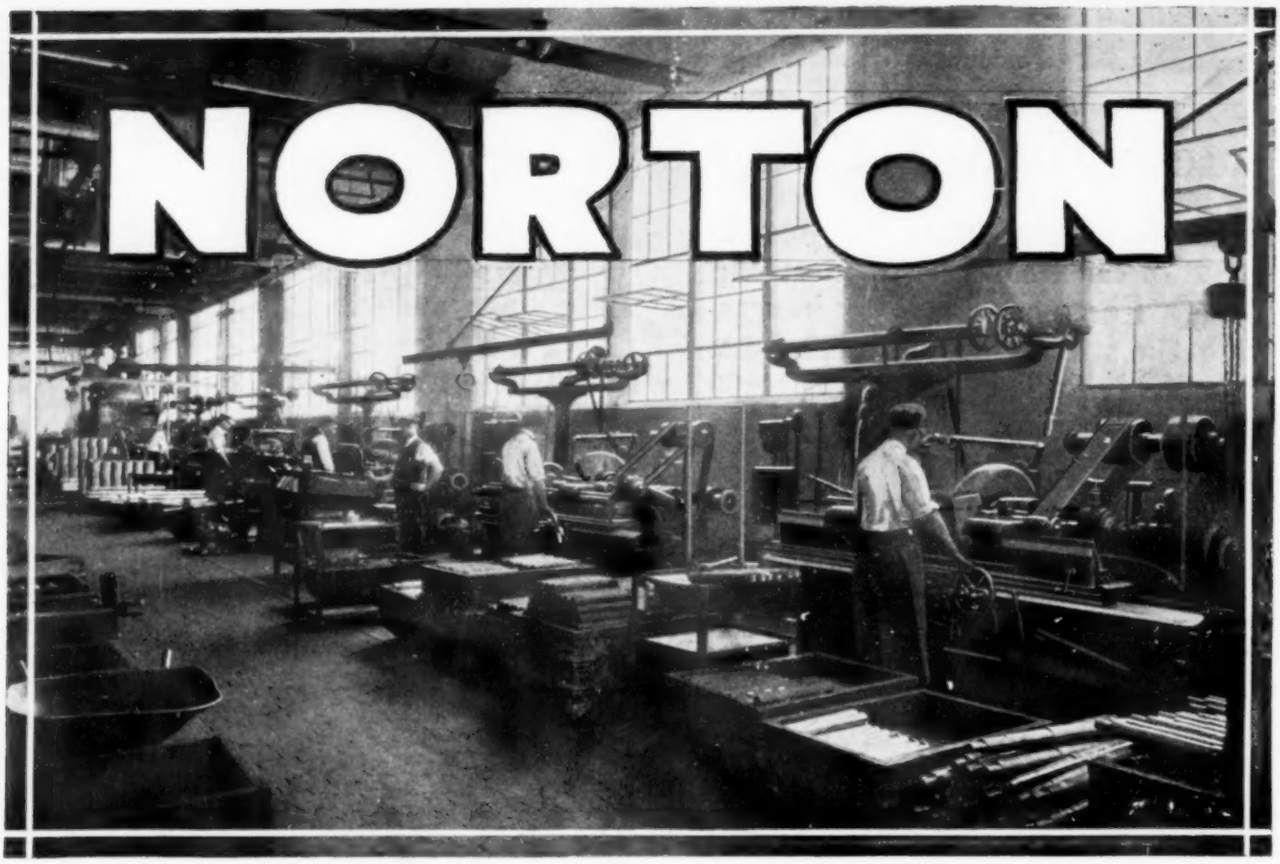
## How Many S. P. M.?

"Haste makes waste" is just as true of hack saws as of anything else. Forcing a blade by increasing the strokes per minute means a quickly dulled blade. 50 to 60 strokes per minute is about as fast as it is economical to run when cutting dry. On soft steel, using compound, saws may be run to advantage at about 100 S. P. M., at from 65 to 80 on annealed steel, and on unannealed tool steel at about 60 to 80 strokes per minute.

Follow the Starrett Hack Saw Chart, put on the weight and watch the cutting cost decrease.

THE L. S. STARRETT CO.
The World's Greatest Toolmakers
Manufacturers of Hack Saws Unexcelled
ATHOL, MASS.

## Use Starrett Hack Saw Blades




# Helping to Keep Down the High Cost of Living

Indirectly, of course, but helping just the same.

This is how. Norton Grinding Machines are here shown grinding truck wheel gudgeons for the famous Holt Tractor. This photograph was taken in the Peoria plant of the Holt Maunfacturing Company.

No other machine, as you know, can compare with the tractor for making two ears of corn grow where one ear of corn grew before.

Norton is making it possible for tractor manufacturers to build tractors at a lower cost.

***How about calling in some Nortons to reduce your manufacturing costs? They can do it.***

## Norton Company, Worcester, Mass.

**Electric Furnace Plants: Niagara Falls, N. Y.; Chippawa, Ont.**
**New York Store: 151 Chambers Street**
**Detroit Store: 73-75 West Congress Street**
**Chicago Store: 11 No. Jefferson Street**

**Agents for Norton Grinding Machines**

Vonnegut Machinery Company, Indianapolis, Ind. Robinson, Cary & Sands Company, St. Paul and Duluth, Minn. Manning, Maxwell & Moore, Inc., St. Louis, Mo. Henry Prentiss Co., New York, N. Y.; Boston, Mass.; Buffalo, N. Y.; Rochester, N. Y.; Syracuse, N. Y., Scranton, Pa. The Motch & Merryweather Machinery Company, Cleveland, O.; Detroit, Mich.; Pittsburgh, Pa.; Cincinnati, O. Eccles & Smith Company, San Francisco, Calif.; Los Angeles, Calif.; Portland, Ore. The Canadian Fairbanks-Morse Company, Ltd., Montreal, Que.; Toronto, Ont.; Vancouver, B. C. C. T. Patterson Company, Ltd., New Orleans, La. Kemp Machinery Company, Baltimore, Md. W. E. Shipley Machinery Company, Philadelphia, Pa. English Tool & Supply Company, Kansas City, Mo. Alfred Herbert, Ltd., Coventry, Eng.; Paris, France; Milan, Italy. The F. W. Horne Company, Tokio, Japan. Iznosskoff & Co., Petrograd, Moscow and Ekaterinburg.

# A short-cut to economy

To use a smaller machine that will do the work just as well is to take the short-cut to economy. To use the

## "ADAMS SHORT-CUT LATHE"

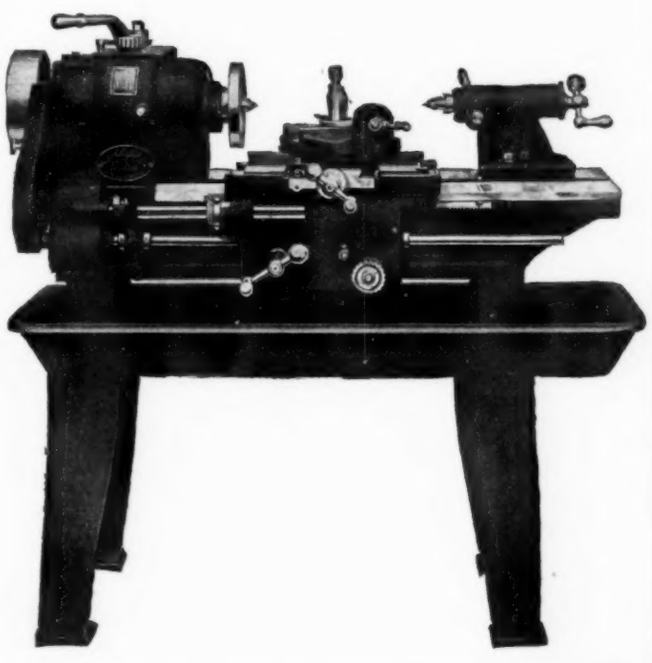
is to do just that. It is a 13⅝-inch swing lathe capable of taking cuts that would tax the ability of machines much larger in swing. Here are some of the reasons:

Powerful geared head with six speeds. All gears run in oil. Handles arranged to simplify control. Massive cross bridge with compound rest arranged so that handles will not interfere. Tail stock spans the bed. Oil pan bed. 19 in. between centers. Weight 1350 lb. Occupies less floor space. *We have exceeded engine lathe production by 50% with it.*

***Take the short-cut. Write now for full particulars.***

**O. R. Adams Mfg. Co., Inc.**
**Rochester, N. Y.**

Represented by the Federal Machinery Sales Co., Chicago, Ill.; Riverside Machinery Depot, Detroit, Mich.; W. M. Pattison Supply Co., Cleveland, Ohio; Fairbanks Co., New York, Boston, Baltimore; Swind Machinery Co., Philadelphia, Pa.; National Supply Co., Toledo, Ohio; Ogden R. Adams, Rochester and Buffalo; Allied Machinery Co., Paris.





Notes On Grinding
NORTON COMPANY WORCESTER, MASS.

*No. 66 A*

## Crystolon wheels for Snagging Brass and Bronze Castings

By H. W. DUNBAR

The physical properties of brasses and bronzes vary as do those of steel. An understanding of the effect of different metals on these properties is of interest and importance to those who are called upon to recommend grinding wheels for snagging castings made of brass or bronze.

Brass is an alloy of copper and zinc in varying proportions from 40 to 90% copper and for special uses other metals are added in small amounts. The tensile strength of copper is 26,000 pounds. This tensile strength is increased to 45,000 by the addition of 30% of zinc to the copper. As the alloy is changed to 50% of each, the tensile strength drops to 1,000 pounds, since tensile strength is the property that resists the removal of material, a change in this property will of course affect the grade of the wheel necessary. With other factors remaining the same the higher tensile strength will call for a harder wheel on snagging operations with sharp contacts and perhaps a softer wheel on snagging, broad contact, and on precision grinding.

Adding lead up to 3% makes a softer, weaker material which will be more apt to load a wheel and call for a structure that will break down more readily. A treated wheel should be tried on this material, if untreated wheels do not prove satisfactory. The filling used in a treated wheel becomes fluid during grinding and lubricates the cutting grain at exactly the point of contact.

Tin and manganese give a harder brass and may make the use of a harder wheel advisable for sharp contact and a softer wheel for broad contact.

Iron to the extent of 1 to 2% increases the tensile strength to 80,000 pounds and gives an iron that produces a very sound, uniform casting. Owing to this high tensile strength an Alundum wheel may be found more efficient than Crystolon, as the latter, being brittle, may break down too fast to give best results.

Bronze is very similar to brass. Phosphorus, aluminum, and manganese with copper produce bronzes that have a high tensile strength, higher in some cases than 20 point carbon open hearth steel. This may also be an Alundum proposition.

A fairly large number of different grains and grades have been successfully used. This large variation is due to kind of material, condition of machines, speed of wheels, operator, size of castings, condition of castings as they come from the foundry, and many other factors.

Crystolon Wheels 24 grade Q and 30 grade P are more often tried and more often successful than the others. We would recommend these two wheels for trial first, unless some local conditions made the trial of some harder or softer wheel advisable.

*NORTON COMPANY*

**Electric Furnace Plants: Niagara Falls, N. Y.; Chippawa, Ont.**
**New York Store: 151 Chambers Street**
**Detroit Store: 73-75 West Congress Street**
**Chicago Store: 11 No. Jefferson Street**

NORTON

# There's a Real He-Man Drill

*It's a* CLEVELAND

THE CLEVELAND TWIST DRILL CO., Cleveland, New York, Chicago

Agents for Europe, CLEVELAND TWIST DRILL CO. (GREAT BRITAIN), Ltd., 36-37 Upper Thames St., London E.C.4.

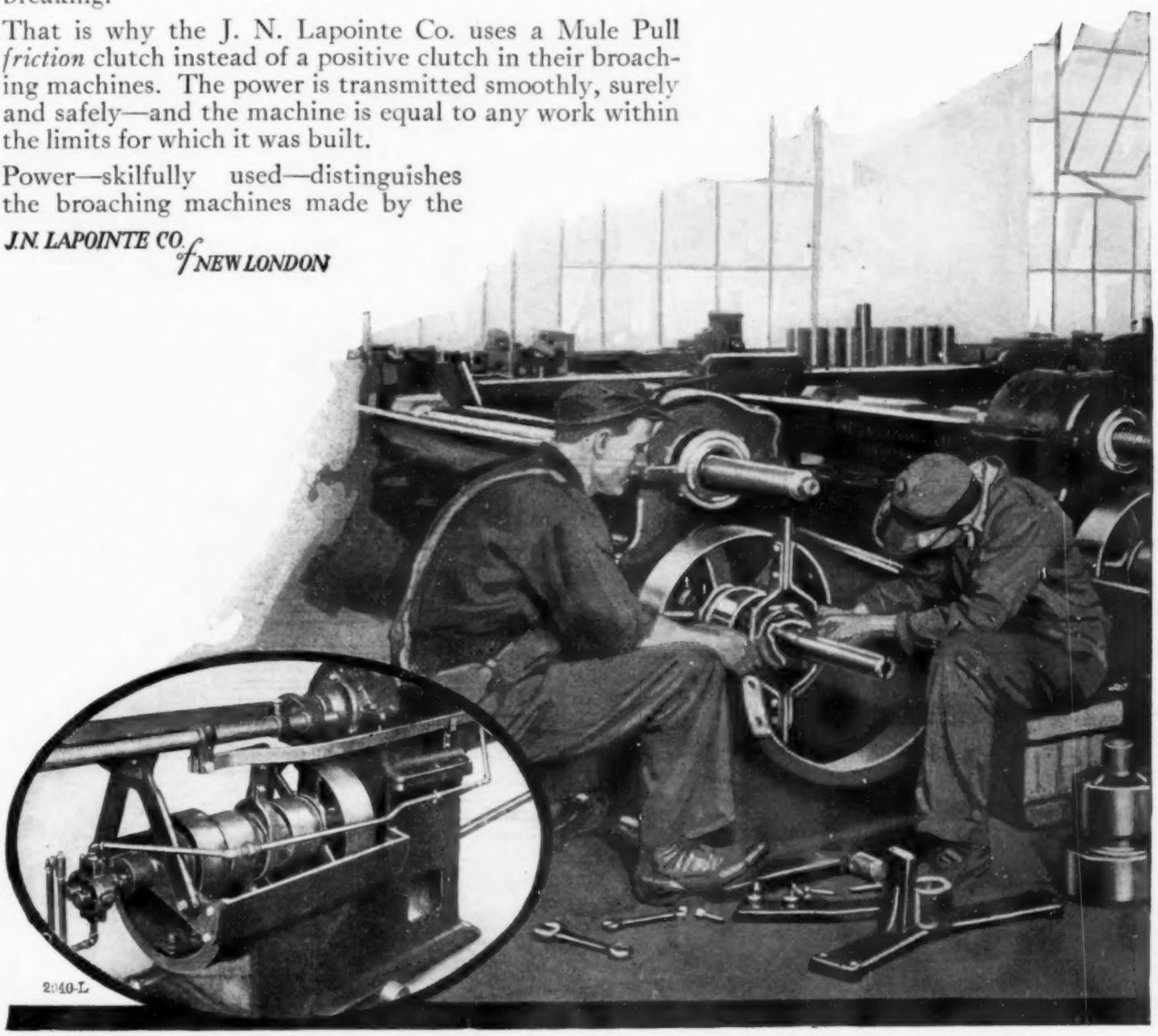
# "A fine example of skilfully exerted power"

WHEN the toughness of the metal or the size of the cut sometimes makes a pull of a hundred thousand pounds necessary to bring the broach through, a broaching machine must not only have adequate strength and power for such a task, but the power must be exerted skilfully. A broach is a delicately hardened tool and, while quite capable of doing this work, could not be expected to stand a sudden shock of such force without breaking.

That is why the J. N. Lapointe Co. uses a Mule Pull *friction* clutch instead of a positive clutch in their broaching machines. The power is transmitted smoothly, surely and safely—and the machine is equal to any work within the limits for which it was built.

Power—skilfully used—distinguishes the broaching machines made by the

*J.N. LAPOINTE CO. of NEW LONDON*




# J.N. LAPOINTE CO.

*of*

## NEW LONDON, CONN.

## Makers of Broaching Machines and Broaches.

MANUFACTURED BY J. T. SLOCOMB CO PROVIDENCE, R.I. U.S.A.

# Get your Slocomb Micrometers in sets—

These racks of Slocomb Micrometers are a common sight in up-to-date tool rooms. They illustrate preparedness—complete provision for a wide range of sizes.

The set illustrated is our No. 20 and includes twelve micrometers, giving a range from 0 to 12 inches, inclusive. Set No. 28—covering 12 to 24 inches—completes the equipment for the ordinary shop, so far as the usual range of measurement requirements is concerned.

These sets are provided with end measures corresponding to the sizes of the micrometers.

The racks are solidly made, of oak and cast iron, with rubber buttons separating the various micrometers. Hooks are provided above each tool for workman's check.

***Measuring has become a science. This fact is recognized fully in the Slocomb "Measuring Book," a compilation of up-to-the-minute measuring methods, sent you with the Slocomb Catalog at your request.***

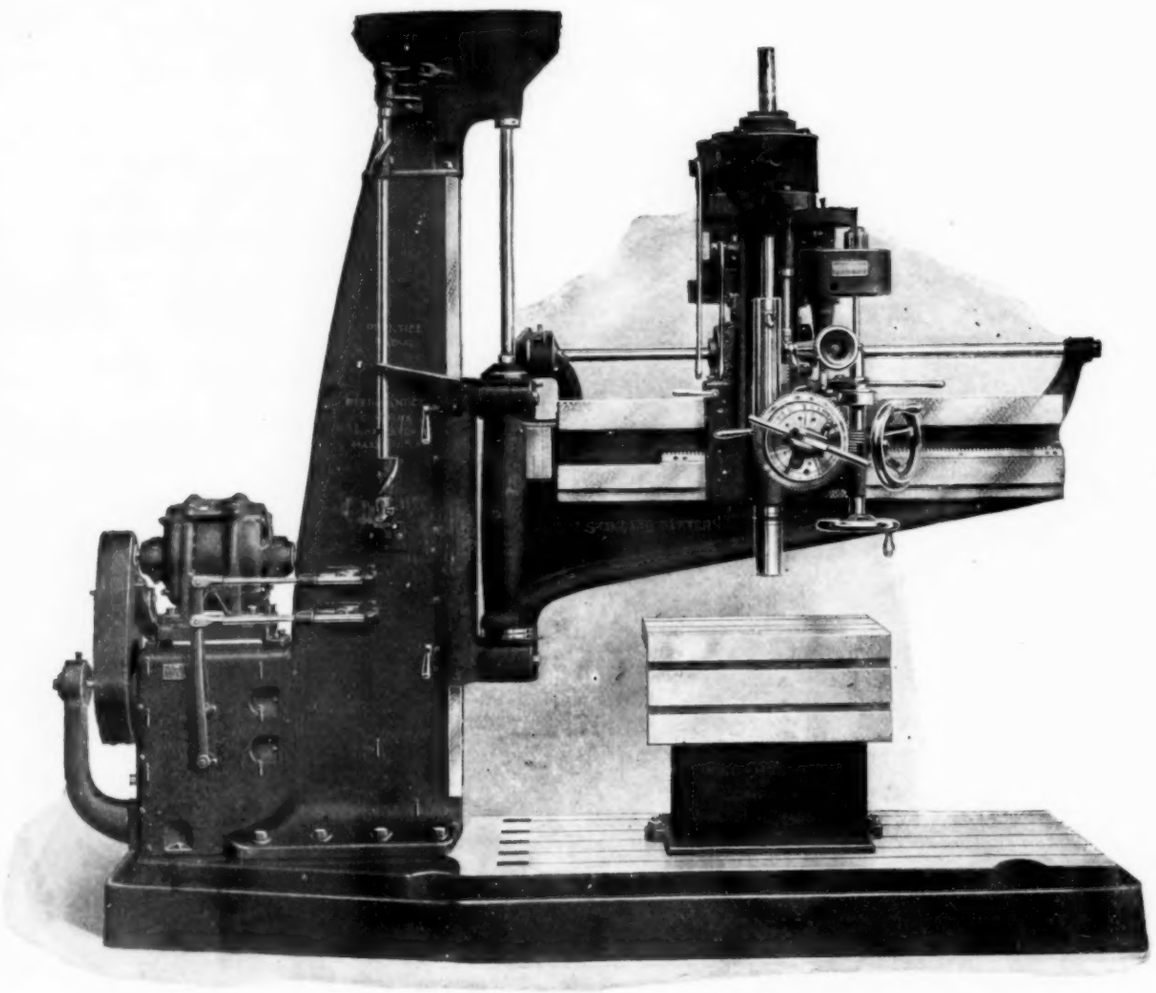
## J. T. Slocomb Company

### Providence, Rhode Island, U. S. A.

**Representative in Chicago:** R. R. Street & Co., Machinery Hall.
**Representative on Pacific Coast:** Charles A. Dowd Sales Co., 330 Market St., San Francisco, Calif.
**Representative in England:** Chas. Churchill & Co., Ltd., London, Birmingham, Manchester, Newcastle-on-Tyne and Glasgow.
**Representative in Italy:** Chas. Civita, Milan.
**Representative in Japan:** Alfred Herbert, Ltd., Yokohama.
**Representative in Australia:** Edwin Wood, Pty., Ltd., Melbourne and Sydney.

# REED-PRENTICE COMPANY

WORCESTER MASS. U.S.A.



5 FT. MOTOR DRIVEN RADIAL DRILLING MACHINE

REED-PRENTICE COMPANY

WORCESTER MASS. U.S.A.

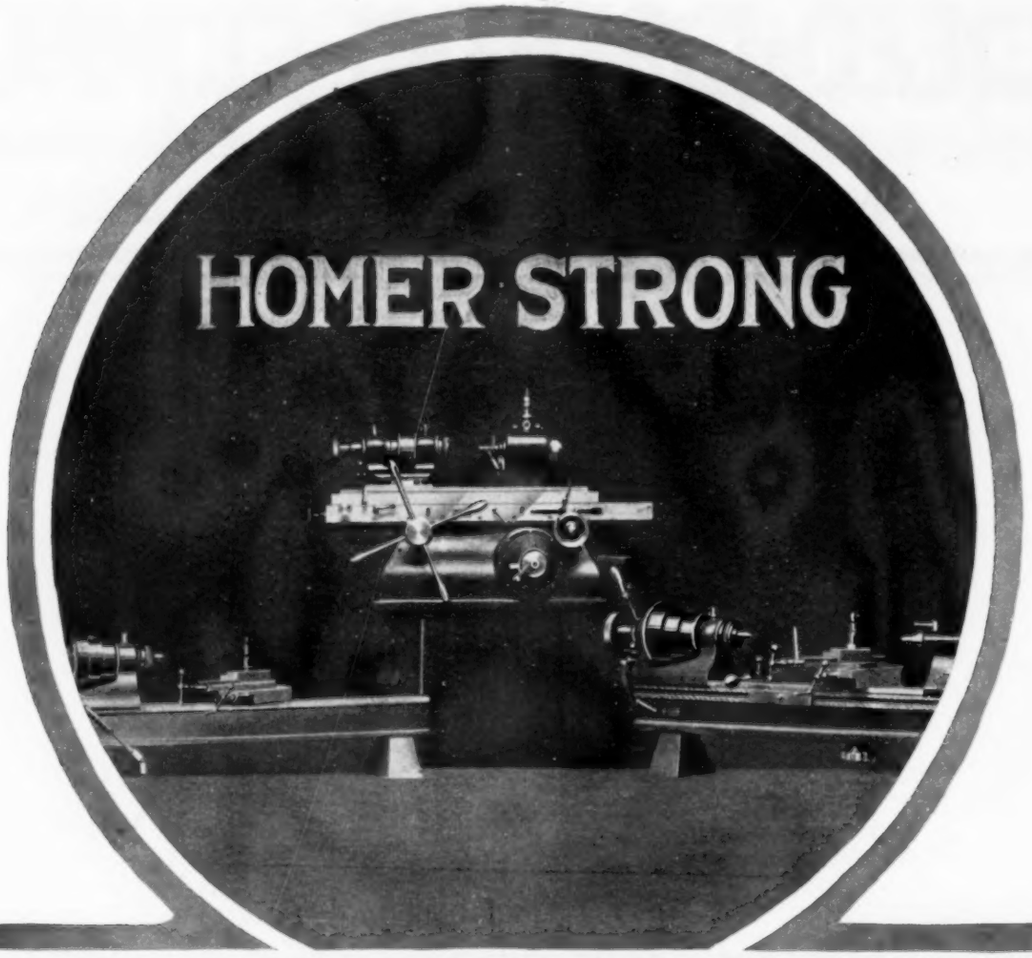
## A Problem in Drilling

TO GET THE MAXIMUM PRODUCTION ANY MACHINE TOOL MUST BE CONSTRUCTED STRONG ENOUGH TO DO ITS WORK TO THE LIMITS OF HIGH SPEED TOOL STEEL. ALL WELL DESIGNED AND WELL BUILT MACHINE TOOLS WILL DO THIS.

IN THE CASE OF RADIAL DRILLING ANOTHER FACTOR IS INTRODUCED BECAUSE THE MACHINES AND NOT THE WORK ARE MANIPULATED. IT IS THEREFORE A VERY IMPORTANT ELEMENT IN GETTING THE MAXIMUM PRODUCTION TO DO SUCH MANIPULATION IN THE SHORTEST POSSIBLE TIME. THE INGENIOUS AND THOROUGHLY PRACTICAL DEVICES WITH WHICH OUR RADIAL DRILLING MACHINES ARE EQUIPPED SOLVE THIS SPEED PROBLEM PERFECTLY.

OUR CATALOGUE TELLS HOW THIS SOLUTION IS ACCOMPLISHED. MAY WE SEND ONE TO YOU?

MANNING, MAXWELL & MOORE, INC.
CANADIAN FAIRBANKS-MORSE CO., LTD.
FENWICK FRERES



# RIVETT

# *Your Rochester Service Station*

Homer Strong is your Rivett Service Station for Rochester, the territory surrounding Rochester and Berkshire County in the State of Massachusetts.

Here you may obtain service almost as thorough as that enjoyed from the main office at Boston. Not only are you able to get Rivett Precision Lathes and Grinders but a wide range of everything Rivett. This includes attachments, bearings, high-speed grinding belts, spindles, collets, spindle oil, face plates, etc. Then too, you may obtain the latest information on Rivett Products and clear instructions about how to get the most out of Rivett Products.

You will learn further information about Homer Strong if you look on the next page. For a complete list of Rivett dealers see the inside back cover.

## RIVETT LATHE and GRINDER COMPANY

**BRIGHTON DISTRICT of BOSTON**

# SERVICE

# Rivett Service Stations

### CHICAGO, ILLINOIS

Machine Tools and Machinists' Supplies
for immediate delivery.
Electric Cranes—Foundry Equipment
We carry a complete stock of Rivett Machines and Accessories.

**Dale-Brewster Machinery Company, Inc.**
**542 Washington Blvd.**

### BOSTON, MASS.

We carry Machine Tools of every description, Power Transmission, Engines, Pumps and other Power outfits, Trucks and Wheelbarrows, Scales, Valves, Automobile and Service Station Equipment, Mill, Mine and Railway Supplies and Specialties. We carry a stock of Rivett Machines, Attachments and Accessories.

**The Fairbanks Company**

### ST. LOUIS, MISSOURI

We represent the Rivett Lathe and Grinder Company and carry a stock of their machines. We are in position to furnish a complete assortment of high-grade machines and shop equipment.

**Blackman-Hill-McKee Machinery Co.**
**1513 North Broadway**

### SEATTLE, WASHINGTON

We represent and carry in stock the products of the leading machine tool manufacturers in the United States as is evidenced by our carrying a stock of Rivett Machines, Attachments and Accessories.

**Hallidie Machinery Company**

### LONDON, GLASGOW, MANCHESTER, SHEFFIELD AND BIRMINGHAM

We carry a full line of the Rivett Lathe and Grinder Company's machine tools. We specialize in machine shop equipment and accessories.

**Buck & Hickman**

### CINCINNATI, OHIO
### INDIANAPOLIS, IND.

We carry a complete line of machine tools for prompt delivery. We also carry a stock of Rivett Machines, Attachments and Accessories.

**The E. A. Kinsey Co.**

### CLEVELAND, OHIO

We stock a complete line of High Grade Machine Tools including Rivett Machines, Attachments and Accessories.

**The Cleveland Tool & Supply Co.**

### PHILADELPHIA, PA.

We have in stock for instant delivery, one each, Cleveland High Power, All-Geared, Plain and Universal Milling Machines. We carry a stock of Rivett Machines, Attachments and Accessories.

**D. Nast Machinery Co.**

Rivett Lathe and Grinder Company, Brito

### NEW YORK, NEW YORK

We are agents for the Champion Tool Works Lathes, Mulliner Tool Room Lathes. We carry a stock of Rivett Machines, Attachments and Accessories.

**Patterson, Gottfried & Hunter, Inc.**

### DETROIT, MICHIGAN

At 997 Woodward Ave. we maintain a showroom for the display of metal working machinery in general and particularly we carry a stock of Rivett Machines, Attachments and Accessories.

**J. R. Stone Tool & Supply Co.**

### TORONTO, CANADA

We represent in Canada the leading manufacturers of High Grade Machine Tools. We carry a stock of Rivett Machines, Attachments and Accessories.

**H. W. Petrie, Limited**

### STOCKHOLM, SWEDEN

High grade machine tools and machine shop equipment our specialty. A full line of Rivett Lathes and Grinders, Attachments and Accessories always in stock.

**A. B. Galco, Ltd.**

### HARTFORD, CONN.

We are local distributors for Monarch Engine Lathes, Ohio Planers and Shapers, Abrasive Surface Grinders. We carry a complete line of machine tools as well as a stock of Rivett Machines, Attachments and Accessories.

**Purinton & Smith**

### ROCHESTER, N. Y.
### ALBANY, SYRACUSE, BUFFALO

We are agents for Hamilton Engine Lathes, G. A. Gray Co., Planers, Kempsmith Milling Machines, Fosdick Radial Drills. In addition to the above we carry a stock of Rivett Machines, Attachments and Accessories.

**Homer Strong**

### LOS ANGELES, CALIFORNIA

Our stock of High-Grade Machine Tools is quite complete. We carry a full line of Rivett Machines Attachments and Accessories.

**Smith-Booth-Usher Co.**

### PITTSBURGH, PA.

Bradford Lathes, Fosdick Radials, Kempsmith Millers and a score of others go to make up our big line of quality tools.

The Rivett Line is one of our latest and best acquisitions. Our stock is open for your inspection.

**Somers, Fitler & Todd Co.**

Rivett Service Stations—exactly! Just as the automobile user makes use of the Automobile Service Station so the user of the Rivett Lathe or Grinder takes advantage of the Rivett Service Stations.

Look over this list. Every Service Station on these pages can give you information and instructions regarding the particulars of Rivett Precision Lathe and Rivett Internal and Radial Grinders; can demonstrate to you the high efficiency of Rivett products and can offer anything in the line of Rivett accessories and supplies.

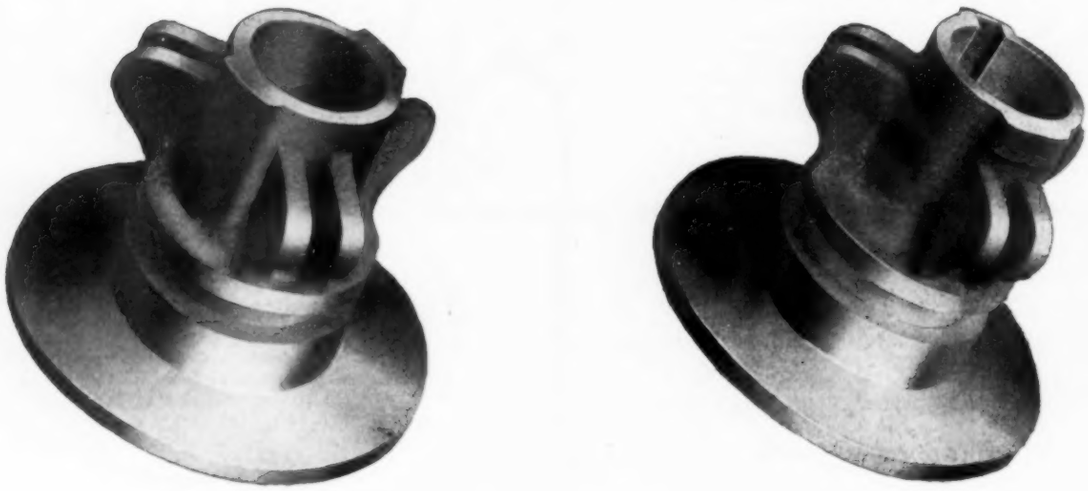
Select the Service Station nearest you—and learn the latest news on Rivett Quality Products.

ton District of Boston

# LAPOINTE O

ORIGINATORS OF CO

# SPEED!



## Cutting Key-Ways On Friction Shifter

All sizes and styles of key-ways can be cut on a Lapointe-of-Hudson Broaching Machine with a speed that defies competition.

For example—above is pictured an oddly shaped bit of work—a Cast Iron Friction Shifter. One of our No. 3 Machines has been cutting a key-way in this work, 2 11/16 inches long, 5/8 inches wide and 25/64 inches deep at the average rate of 200 per hour.

There is no other method of cutting key-ways with such economical speeds. As the operator of this machine said, "It is O.K. on all key-way cutting production work."

**Broaching on our machine is not limited to cutting key-ways. There is practically no internal cutting problem such as oil grooves, gear teeth, splines, rounds, squares, odd shapes, etc., that cannot be solved on this Broaching Machine. It will operate faster and more economically than any other machine on the market.**

**Alfred Herbert, Ltd., Paris, France; Madrid, Spain; Yokahama, Japan**
**Burton, Griffiths & Co., Ltd., London, Eng.**
**Charles Civita, Milan, Italy**

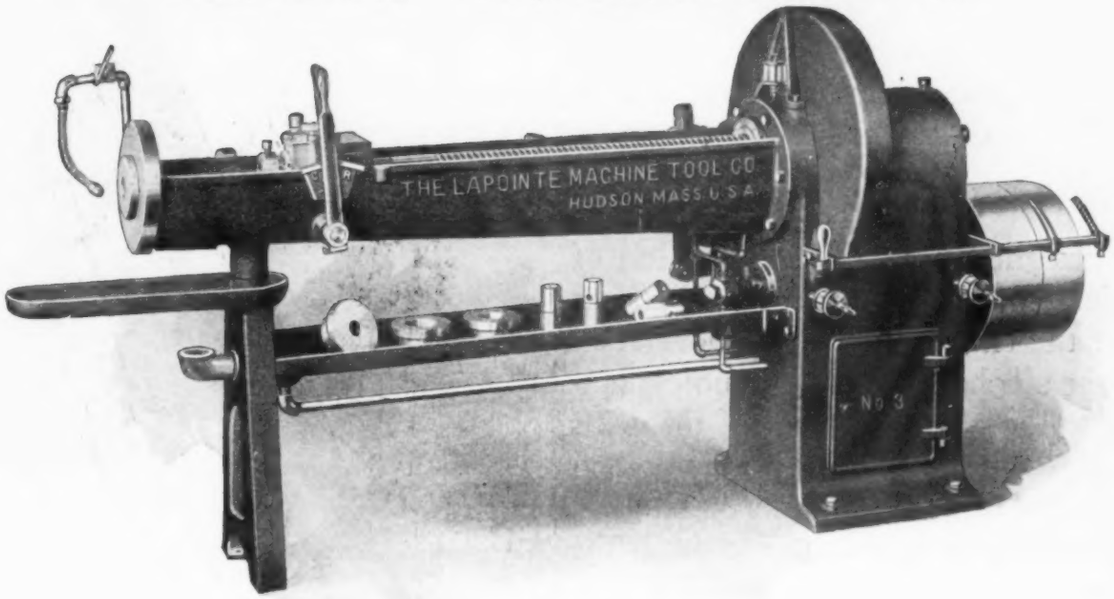
# LAPOINTE MAC

HUDSON

OLDEST AND LARGEST
BROACHING MACHINES AND

# F HUDSON
## MMERCIAL BROACHING

# ON THIS!




## The Lapointe-of-Hudson No. 3 Broaching Machine

For an all-'round broaching machine this No. 3 Lapointe-of-Hudson stands at the top of the list. It combines the speed of the lighter machine with a rigidity suitable for heavy work.

As in all of our machines, the working parts are made by us and tested many times by our expert engineers before being assembled.

The draw head is made of a steel billet, and has extra long bearings on the way of the machine.

The draw screw, driving shafts, etc., are the best quality of nickel steel. Gears, broaches, etc., are hardened in our own heat treating departments.

The draw nut is made of an unusual grade of phosphor bronze which assures perfect running from 3 to 5 years without replacing.

Our patented quick return screw makes this the fastest broacher on the market.

**Our machines are being used for all sorts of cutting. The possibilities are almost unlimited. If you will but send specifications of your problems to our engineers they will gladly tell you the possible production you can gain on our machines. This service is gratis.**

**Scandinavia Agents: V. Lowener, Vesterbrogade 9 B., Copenhagen, Denmark**
**V. Lowener, Drottinggattan 90, Stockholm, Sweden. V. Lowener's Maskinforretning, Sverre Mohn, Christiania, Norway.**

# HINE TOOL CO.
MAKERS IN THE WORLD OF BROACHING TOOLS EXCLUSIVELY
MASS. U.S.A.

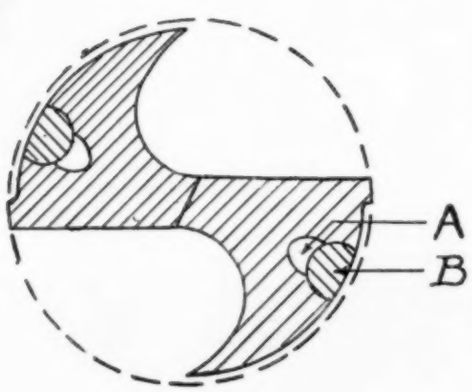
# Proper lubrication as necessary as correctly sharpened drills

In order to drill holes cleanly, accurately and rapidly in addition to right cutting conditions, you must have proper lubrication. Just pouring oil over the work and drill is not proper lubrication, especially when drilling deep holes. You must have **oil where oil is needed**—at the cutting edges.

## THE LINCOLN OIL DRILL

was designed to give just that kind of lubrication. By the use of drill rod at B for the channel covering, dovetailed into the oil channel A, the troubles common to the ordinary types of oil drills are overcome. There is no denting in of the drill rod, blocking the oil channel or breaking away of the rod from the groove.

**Practically a solid, self-oiling drill.**




**We guarantee every drill. Write today for Catalog No. 10A with full particulars about this scientifically and mechanically right drill.**

**Lincoln Twist Drill Company**
**Taunton, Mass., U. S. A.**

# INTERNATIONAL TIME AND COST RECORDERS

**International Master Clock**
Drives and regulates Time Recorders, Cost Recorders, Time Stamps, Program Devices, etc.

## Increase Production
by making employees punctual

## Reduce Expenses
by cutting the cost of timekeeping

## Promote Supervision
by supplying data necessary in organizing the force for the best results

## Improve Morale
by eliminating payroll disputes

## Encourage Loyalty
by giving the loyal employee full credit for his work

**International Electric Card Recorder**
Tells to the minute when each worker arrives in the morning, when he leaves at noon, when he returns from lunch, when he leaves in the evening. Clearly prints all data needed for accurate timekeeping and full payroll protection.

**International Electric Cost Recorder**
Shows to the minute how much time each worker puts into each job throughout the day. Makes it possible to compute production charges fully and reliably.

## They tell exactly when each employee
**—reports in the morning**
**—goes to lunch**
**—returns from lunch**
**—leaves at end of day**
**—and how much time he spends on each job**

They do this with mechanical accuracy, and there is no chance of error. A late "In" or an early "Out" or overtime is recorded in red, which instantly identifies cards requiring a special entry by time clerk and saves 90% of payroll clerical work, thus reducing clerical expense.

There are 260 Models of Internationals. They may be had either electrically operated or spring driven. Suitable for businesses of any kind and size. Prices $50 up.

**Write today for complete literature showing how Internationals are adapted to *Your* Business**

## INTERNATIONAL TIME RECORDING COMPANY

**General Offices: 50 Broad Street, New York** **Works** Endicott, N. Y. Toronto, Can.

*Canadian Office*: International Business Machine Co., Ltd., 300 Campbell Avenue, Toronto
*London Office*: 57 City Road, Finsbury, London, E. C., England *Paris Office*: 75 Avenue de la Republique, Paris, France

***Offices and Service Stations in all principal cities of the world***

# POWELL

## Hy-Speed-Cut PLANER

### Speed up your planing from 60 feet per minute to 150 feet per minute

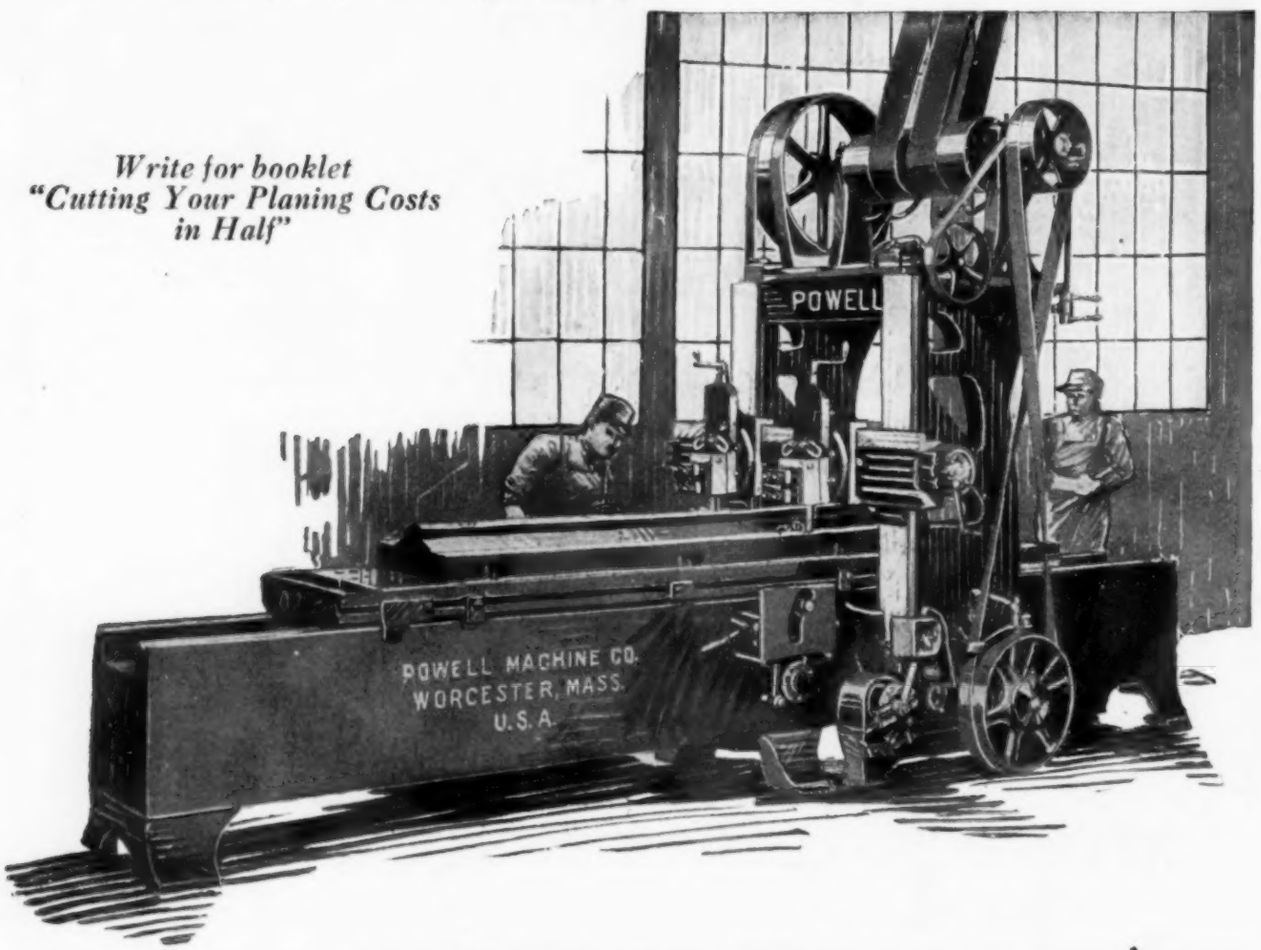
A cutting speed greater than 40 to 60 feet per minute on the ordinary planer is impracticable because of the shock and consequent breaking down of the tool.

But the Powell Hy-Speed-Cut Planer, by means of its exclusive accelerating feature, starts the cut at the ordinary speed and then accelerates to as high as 150 feet per minute.

In this lies the explanation of the Powell Planer's ability to save 30% to 50% on the operating time.

Let us know your planer requirements.

*Write for booklet "Cutting Your Planing Costs in Half"*




**POWELL MACHINE COMPANY**
**243 STAFFORD ST., WORCESTER, MASS.**

*"Made by WILTON in Boston, Mass., for Americans"*

# WILTON Master Blocks

stand for

## Inexpensive Accuracy

**Made on the basis that the first requirement of a self-contained gauging system is accuracy, WILTON Master Blocks are guaranteed to pass the tests of the United States Bureau of Standards as being accurate within .00001 inch.**

**As to price, WILTON Master Blocks are designed to lower the cost of accuracy. They are sold at a price which justifies their use in unprecedented ways. WILTON Master Blocks are made to be not only admired, but also used.**

**Set A, 5 Blocks, $25.00** **Set C, 35 Blocks, $175.00**
**Set D, 81 Blocks, $405.00**

***Immediate deliveries. Put in your order now***

## WILTON TOOL & MANUFACTURING CO.

**Linden Park St., Boston, Mass.**

Cleveland, O McCormick Building, Chicago, Ill. Detroit, Mich.

Kreodone
EVERLASTING

WOOD BLOCK FLOORS

## —stand for changeless quality and unequalled service everywhere

BOTH *special quality* and *longer service* are based on the exclusive use of *long-leaf* yellow pine and its treatment, in block form, with a *pure, unadulterated creosote oil.*

Our engineers and chemists insist on an unadulterated creosote oil. Why? Because they know floors of all kinds "inside out."

Yes, we know floors. Why shouldn't we? We made the first wood block floor ever laid in the United States—and we have been in the business continuously for nearly three decades since then.

We offer you freely the services of our Engineering Department. Ask for a survey and analysis of your plant floors.

You cannot fail to benefit in the saving of money and trouble. *The service is free.*

Write for our free, illustrated booklet showing KREODONE Floors a success under specially hard conditions.

***Peerless Motor Car Co., Cleveland, Ohio. We have several repeat orders from this plant.***

**Get the *Genuine KREODONE* Blocks**
**Watch that Spelling—it means Service**

**REPUBLIC CREOSOTING COMPANY, Indianapolis, Ind.**
**Plants: Indianapolis Minneapolis Mobile Seattle Norfolk**

BRANCH OFFICES:

315 Peoples Gas Bldg., Chicago
206 Erie County Bank Bldg., Buffalo
152 Fay Street, Toronto, Canada
Berkley Ward, Norfolk
222 Society for Savings Bldg., Cleveland
31 Transportation Bldg., Philadelphia
828 Plymouth Bldg., Minneapolis
445 Central Bldg., Seattle
Masonic Temple, Mobile
211 Hammond Bldg., Detroit

# FLATHER LATHES

**Special Features**

Flather Lathes have many special features of value too numerous to mention here, but every one of them tends to greater production, ease of operation and a better working machine. We have a catalogue which tells you all about the many features. It will interest you—why not write for it today—now, while you think of it?

**Flather & Company, Inc.**
**Nashua, N. H., U. S. A.**

***A Very Easy Way to Tap a Barrel of Oil***

Simply drill a hole in the top of the barrel, and put in a

# ROTHWEILER PUMP

**No Drip—No Waste**
**Costs but $10.00**

*Dealers in all large cities*

**Rothweiler & Co., *Manufacturers* Seattle, U.S.A.**

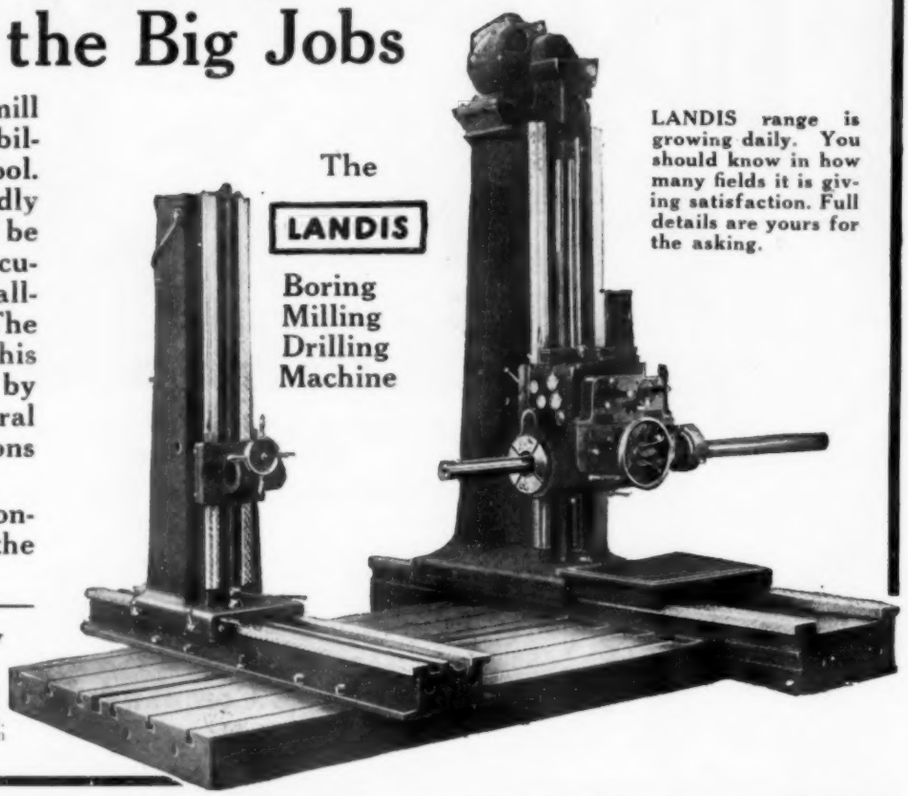
# LANDIS Durability Shows on the Big Jobs

**Shipyard and steel mill work will test the durability of any machine tool. The big, awkwardly shaped castings must be as rigidly held and accurately machined as smaller and plainer parts. The LANDIS proves up on this work and saves time by reason of allowing several machining operations with one set up.**

**Design, material and construction tell in the LANDIS.**

The **LANDIS**

Boring
Milling
Drilling
Machine



**LANDIS range is growing daily. You should know in how many fields it is giving satisfaction. Full details are yours for the asking.**

**Landis Tool Company**
Waynesboro, Pa.
New York Office, 50 Church St.
AGENTS:
Dewstoe Machine Co., Birmingham, Ala.; Harron, Rickard & McCone, San Francisco and Los Angeles.

# The R-S ½-in. Radial Tapper

## A Highly Productive Machine on Automobile and Machine Tool Work

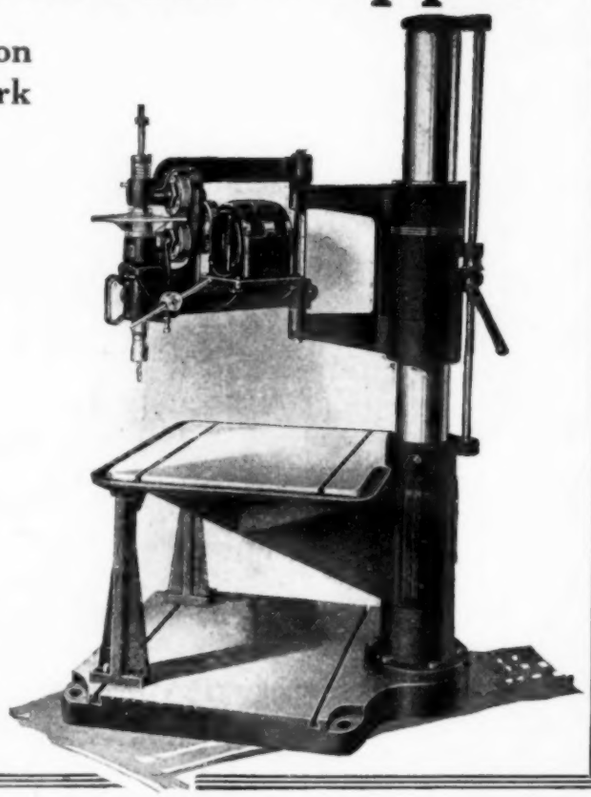
Its table is placed in a position suitable for the work.

The spindle travels to and from the work. In the ordinary vertical tapper, the table must be raised and lowered for each hole to be tapped.

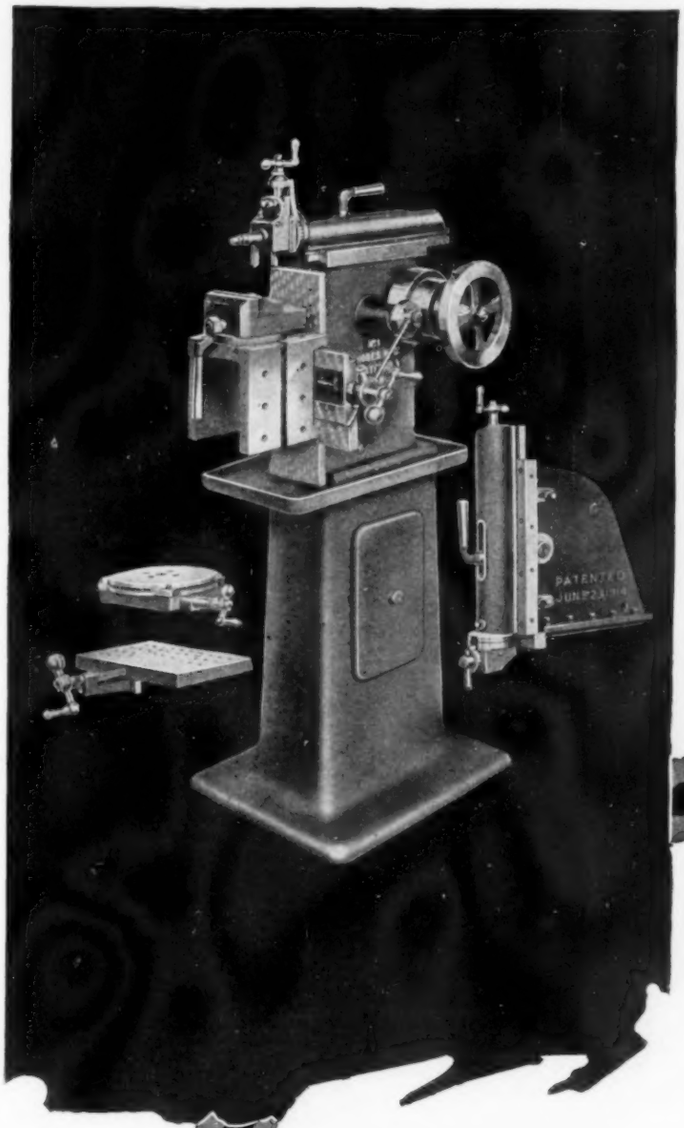
While the driving mechanism is practically identical to that of the horizontal type, the chuck spindle is splined to and travels vertically in the friction disc spindle.

The R S ½-in. Vertical Tapper, like our ¼-in. machine, is equipped throughout with **S. K. F. thrust** bearings. All annular bearings are made of phosphor bronze.

***Write for complete details.***



**Rickert-Shafer Company**
**Erie, Pa.**
New York Office: 50 Church St.
Cleveland Office: Rockefeller Bldg.
Detroit Office: 66 W. Larned St.
Chicago Office: R. R. Street Co., Machinery Hall
Agent for Sweden: A. B. Galco, Ltd., Stockholm
Agent for England, France and Italy: Alfred Herbert, Ltd.



# RHODES

## 7 inch Horizontal

## and

## 3½ inch Vertical

# SHAPER

## An Economic Unit

Every shop has a limited area which is non-productive because there seems to be no way of utilizing it to advantage.

Install the Rhodes Combination Shaper and Slotter and that space will be productive—will become a producing unit.

Applicable to a wide range of accurate machining, it is quickly converted from a horizontal shaper with a 7-inch stroke to a 3½-inch vertical slotter, adjustable to 10 degrees. For light shaping and slotting where accuracy is the first consideration.

**Dept. 103**

## The Rhodes Mfg. Co.

Hartford
Connecticut

# A Few Reasons

## *Why* YOU *Should Use*

# LIBERTY PLANERS

**1**—The bed extends to the floor and forms a solid foundation for the machine. The top is closed between the tracks except thru the gearing section. Here it is reinforced by heavy girths.

**2**—The tracks are wide and "V" shaped. Their ample spread eliminates unnecessary overhang of table. Automatic Oil Rollers insure proper lubrication.

**3**—Running gear is placed inside bed and is easily accessible from top. Gears are pressed into the hubs of the pinions relieving the shafts of all torsional strains.

**4**—Driving pulleys are made of aluminum with cast iron centers. This increases strength. By reducing their weight, the inertia at high speeds is reduced to a minimum. Noise from belt slippage is thus reduced.

**5**—Wide belts insure ample driving power.

**6**—Shifting mechanism is enclosed and operates with speed and quietness. A safety lock secures the mechanism and prevents accidental starting of table.

**7**—Table is extra deep and heavily ribbed, all slots are planed from the solid.

**8**—Housings are of box type extending to floor. They are attached to bed with large taper plugs and bolts. A heavy cross brace affords a rigid support when rail is at highest position.

**9**—Patented Automatic Safety Feed is a decided improvement. Operator can control or change the feed on rail heads without stopping machine or disturbing feeds on either right or left side heads.

**10**—Cross Rail is of deep box section, well braced at back; it is made sufficiently long to accommodate two heads allowing either head to have full traverse across table.

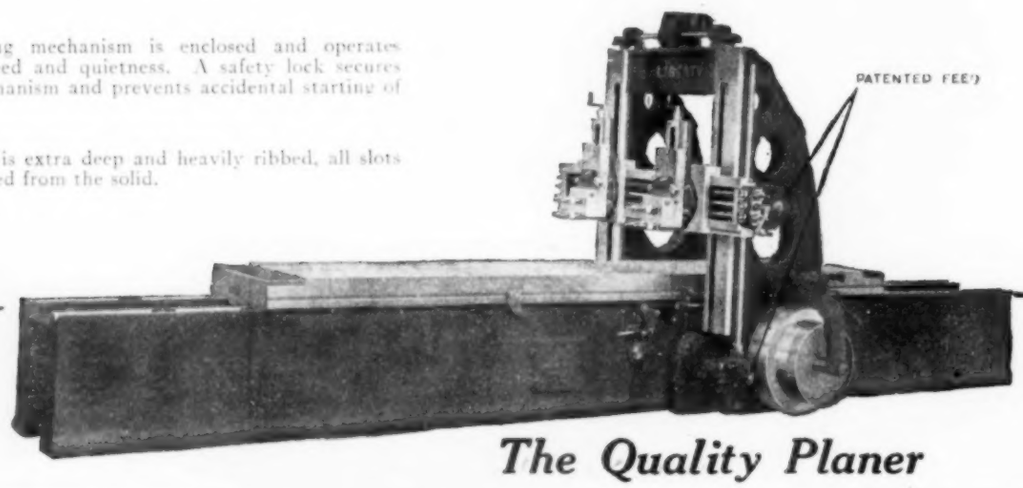
**11**—Heads have long and wide bearing on the cross rail, and are made right and left for close range.

**12**—Elevating device centrally located on top brace is self-contained. It has safety features which protect it from breakage.

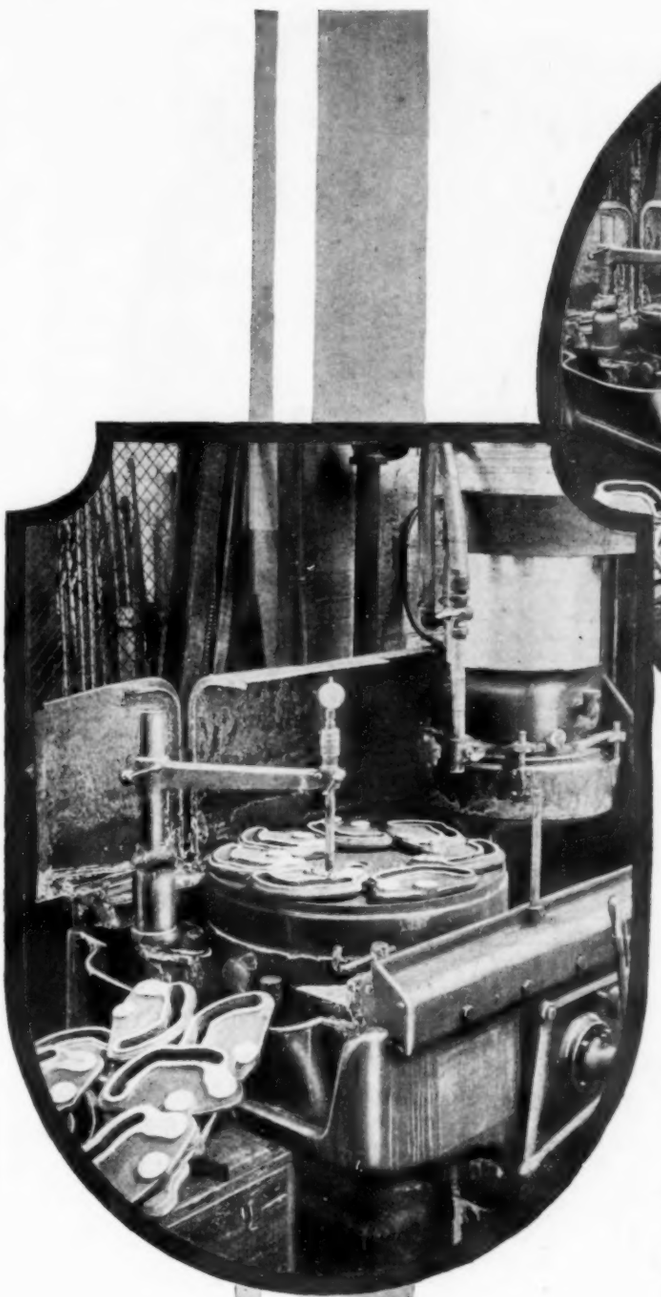
**13**—Side heads are properly counter-balanced and can be moved below table top when not in use.

**14**—Countershaft is equipped with Hyatt Roller Bearings and all pulleys are properly balanced. If this synopsis interests you send for the catalog giving detailed description.

## LIBERTY
## Machine Tool Co.
### Hamilton
### Ohio




*The Quality Planer*



# "Blanchard" for Speedy Grinding

Keep that thought in mind when thinking of new machine equipment. Here's an average case in point.

In the Cincinnati Planer Co. shops this operator on a Blanchard High Power Vertical Surface Grinder grinds both sides of 40 cams per hour. These cams are of cast iron 1.125-inch thick in the rough and finished to 1-inch, with a tolerance of 0.001-inch.

This rapid production is secured through the speed and rigidity of the machine combined with that important feature, the Blanchard Magnetic Chuck. The rough castings, which have had no previous machining, are simply placed on the chuck. The elimination of fixtures and set-up saves the operator time and enables him to show a big turnout at end of each day. He can grind all kinds of odd shapes with great rapidity.

The Continuous Reading Caliper Attachment saves time in measuring and insures accuracy.

**We will cheerfully advise approximate output if you will send blueprints.**

## The Blanchard Machine Co.

**64 State Street, CAMBRIDGE, MASS., U. S. A.**

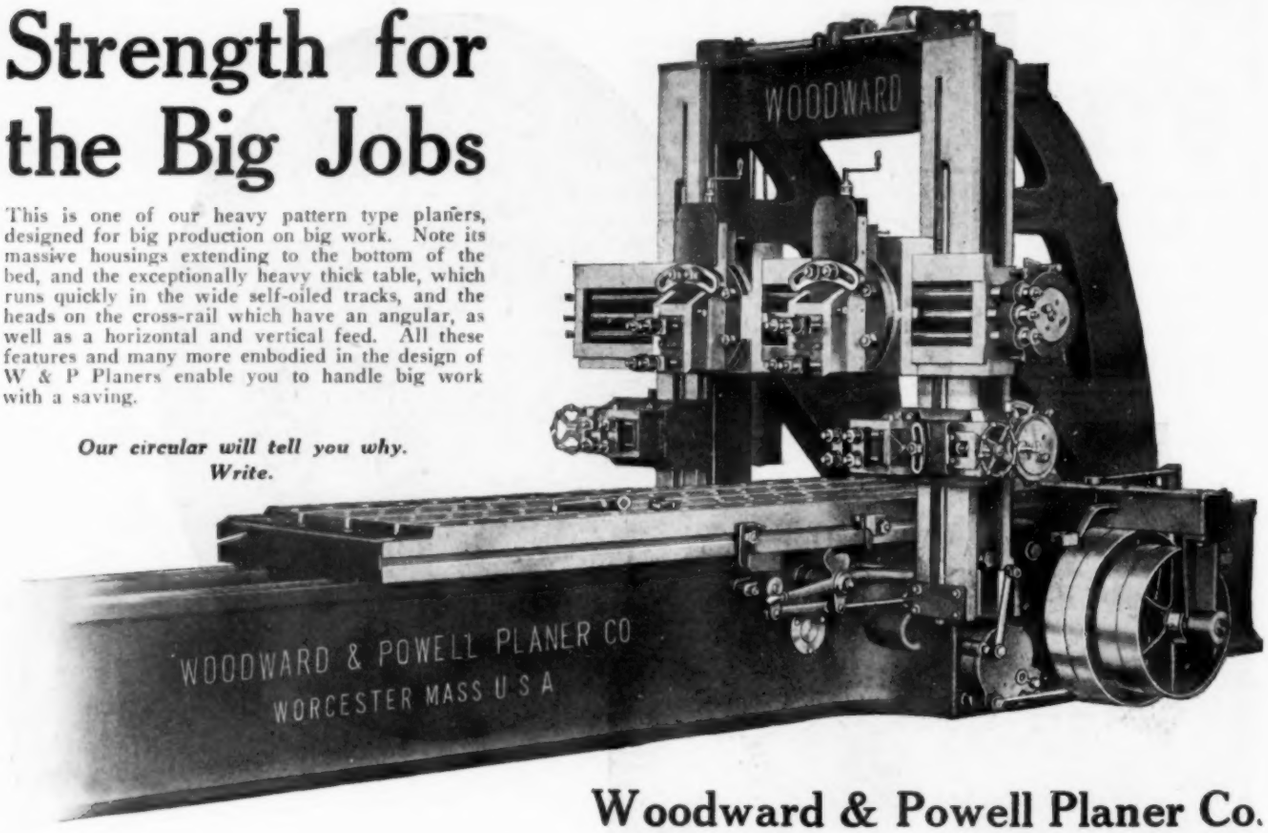
**UNITED STATES**—Henry Prentiss & Co., Inc., Motch & Merryweather Machinery Co.; Marshall & Huschart Machinery Co.; W. E. Shipley Machinery Co.; Kemp Machinery Co.; Robinson, Cary & Sands Co.; Pacific Tool & Supply Co.

**CANADA**—Williams & Wilson, Ltd.; A. R. Williams Machinery Co. **GREAT BRITAIN**—C. W. Burton, Griffiths & Co. **FRANCE**—Anx Forges de Vulcain. **ITALY, SWITZERLAND, BELGIUM, SPAIN AND PORTUGAL**—Allied Machinery Co. of America.

# Strength for the Big Jobs

This is one of our heavy pattern type planers, designed for big production on big work. Note its massive housings extending to the bottom of the bed, and the exceptionally heavy thick table, which runs quickly in the wide self-oiled tracks, and the heads on the cross-rail which have an angular, as well as a horizontal and vertical feed. All these features and many more embodied in the design of W & P Planers enable you to handle big work with a saving.

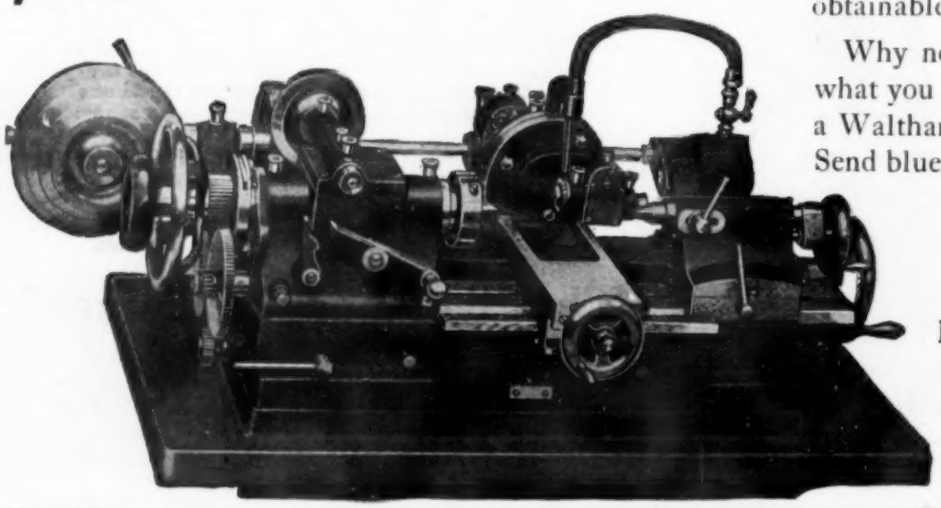
***Our circular will tell you why. Write.***




**Woodward & Powell Planer Co.**
**Worcester, Mass.**

# *Waltham*

## *the economical thread miller for your small parts*



Handles work 7¼ inches long not exceeding 3 inches in diameter. Multiple cutter can be used for some threads, a complete thread being produced in one revolution of the work. By shifting the pulleys and belt, 16 different feeds are obtainable.

Why not let us tell you what you can save by using a Waltham on your work? Send blueprints or samples.

**Waltham Machine Works**
**High Street**
**Waltham, Mass.**

# Rowbottom for Cams

## Face, Drum, Barrel or Box

No matter what your requirements in cams are, you can cut them faster and more economically on a Rowbottom Cam Milling Machine than by any other method.

Rowbottom cams are cut accurately. No expensive hand finishing is necessary.

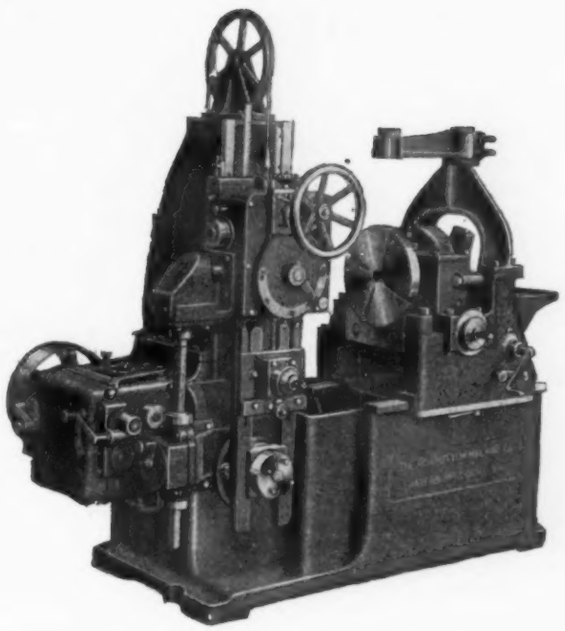
If your needs are not sufficient to install this machine we'll make your cams at exceptionally reasonable prices.

*Write for our descriptive circular.*

**The Rowbottom Machine Co.**

**Waterbury, Conn.**

**Factory: Waterville, Conn.**



## Shaper convenience with planer accuracy

Both of these qualities are combined in the

# Coulter Tool Room Open Side Planer

Consider the convenience of the open side—of the four speeds—of the close accuracy possible with this tool.

The Coulter Open Side Planer is a well designed tool, with bearing surfaces so placed as to give the maximum rigidity to the cross-rail. Its control, too, is handy and centralized.

Your jig work, die work, and general toolroom work demands this tool. Write us for bulletin and full details.

**"Automatic" Machine Co.**

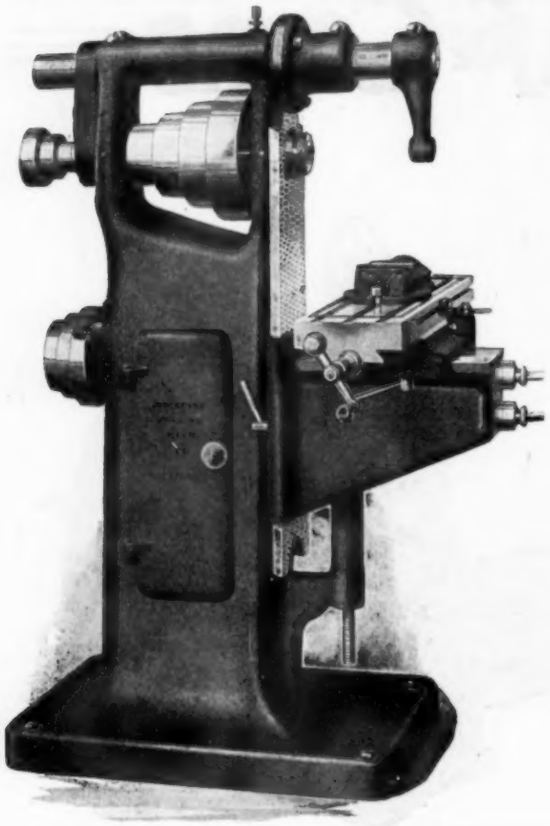
**Bridgeport, Conn., U. S. A.**

OVER-SEAS REPRESENTATIVE

ALMACOA ALLIED MACHINERY COMPANY OF AMERICA ALMACOA

31 CHAMBERS ST. NEW YORK, U.S.A.

Paris, Turin, Zurich and Barcelona.



# Rockford No. 0 Plain Milling Machine

THIS is a rigid, well-balanced machine, designed to fill the requirements of the shop where fast, economical production is demanded. The Rockford No. 0 Plain Miller has no unnecessary parts, no complicated adjustment—and no demand for unusual skill on the part of the operator to produce its maximum efficiency. Because of its simple construction, yet wide range of work, it is adaptable to the big manufacturing plant, where large quantities of one product are in constant demand, as well as to the small shop, where many different and unusual jobs are taken.

***Write to us for particulars. Your inquiry will receive prompt attention.***

**The Rockford Milling Machine Co.**
**Rockford, Illinois, U. S. A.**

A. A. Jones & Shipman, Ltd., Leicester, England, Great Britain. Louis Besse, Paris, France, France and Belgium. Monti & Oscuro, Milano, Italy and Colonies. Rylander & Asplund, Stockholm, Sweden, Scandinavia. Casamitjana Hermanos, Barcelona, Spain, Spain and Portugal. Selson Engineering Co., Melbourne, Australia. M. Mett Engineering Co., Petrograd, Russia.

*"DON'T know how I could handle this operation economically in any other way than with the Bilton Gear Miller."*

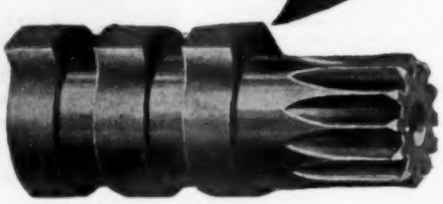
Superintendent Eastern Tube & Tool Co.

***Write Us Today for Catalog 10-G***

## This is a typical example of

# Bilton Gear Miller

work. The Eastern Tube & Tool Company, Brooklyn, N. Y., are equipped with the most efficient machines obtainable for the speedy production of their well-known "Quictite" Full Automatic Drill Chuck. The illustration shows a No. 1½ Bilton Gear Miller at work on one of the chrome-nickel jaws of this chuck—a tough proposition demanding precision. The full automatic operation is well illustrated on this particular job, for one man easily runs three machines.



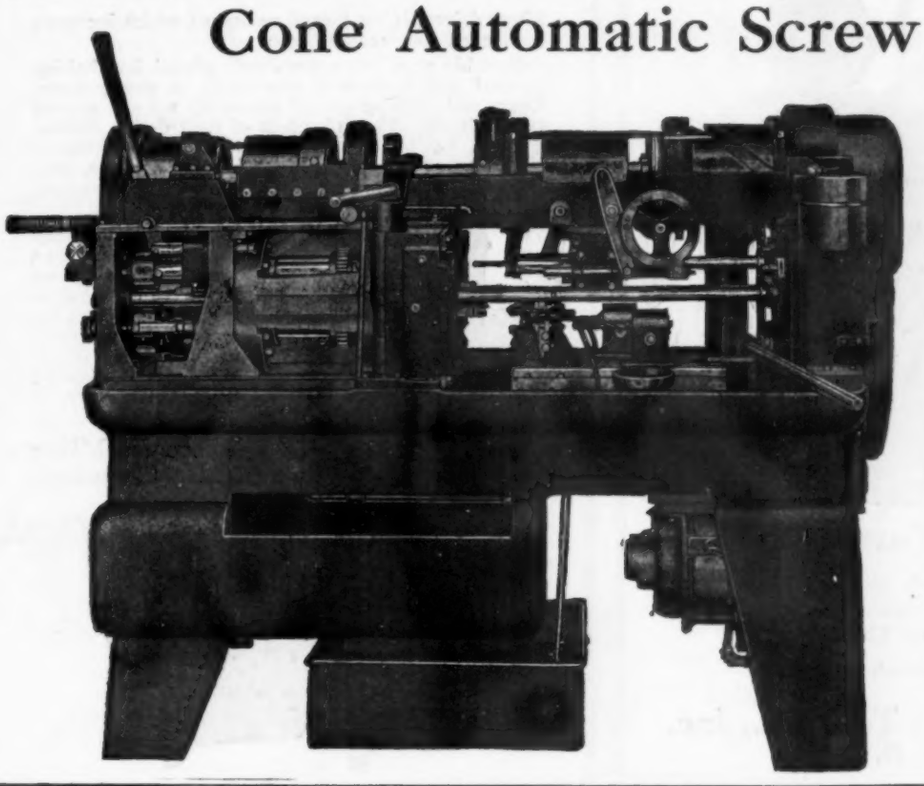
**Over 500 leading manufacturers now use the Bilton Gear Miller — enjoying the fruits of accurate production.**

**Bilton Machine Tool Company**

**Housatonic Ave., Bridgeport, Conn.**

**Foreign Agents: Alfred Herbert, Ltd. M. Mett Engineering Co. Chas. Churchill & Co., Ltd.**

# A Better Product and More of it—
## Cone Automatic Screw Machine



The improved design and excellent construction of the Cone Automatic Four-Spindle Screw Machine enable manufacturers to turn out a big volume of high-class product at the lowest possible cost of production.

Double-bed construction; spindles hardened steel ground all over and run in adjustable bearings of phosphor bronze; wide tooling range; chip problem eliminated.

Cone Automatics are made in four sizes, 1 in, 1¼ in., 1½ in. x 6 in., and 3½ in. x 7 in. long.

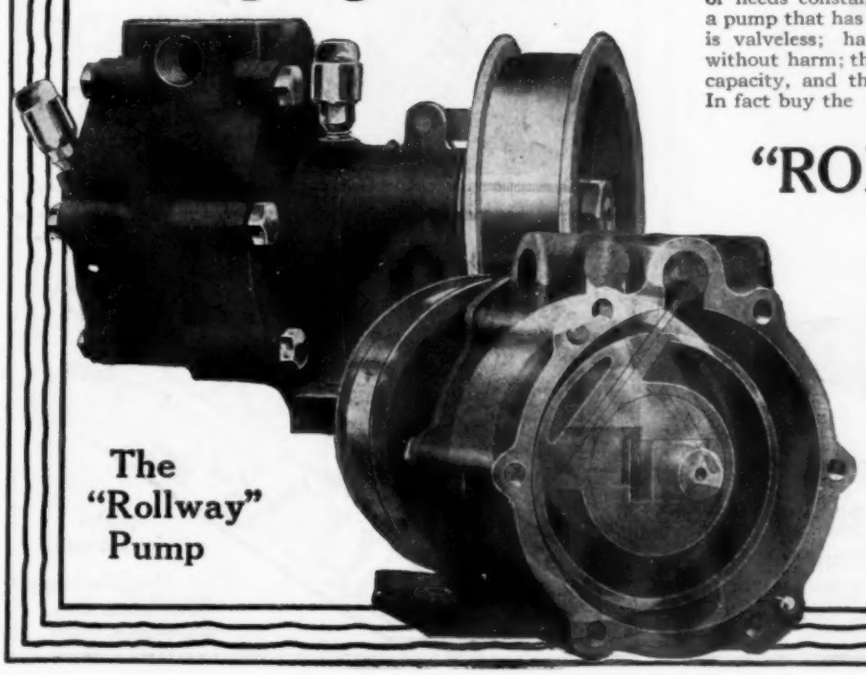
**Circular?**

**Cone Automatic Machine Co., Inc.**

Windsor, Vermont

Agent Michigan Territory:
Mr. J. C. Austerberry
65 Shelby St., Detroit, Mich.

# A Few Pumping Pointers



The "Rollway" Pump

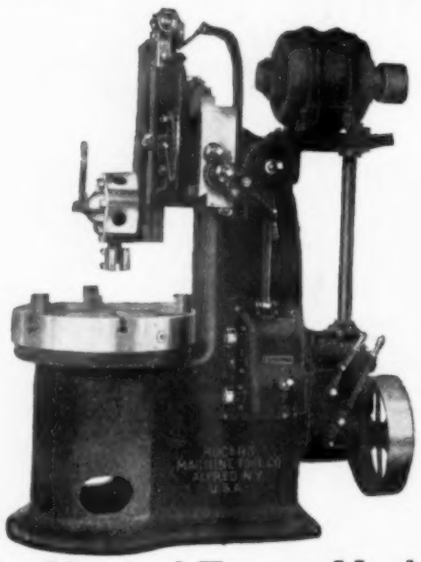
In selecting a cutting oil or force feed lubricating pump be sure to have one that will unfailingly deliver under high or low speeds. One that will operate in any position and one that will not clog when foreign matter enters the intake. Don't buy a pump that requires frequent repair or needs constant attention for priming. Buy a pump that has few parts (none delicate); that is valveless; has no gears; that will reverse without harm; that is small in size and large in capacity, and that is economical in operation. In fact buy the

## "ROLLWAY"

and you can forget the pump and devote your full attention to machining. Our catalog shows sizes and types and gives full details of the advantages of the "Rollway" Pump. Send for your copy.

**Michigan Machine Co.**
58 Porter St.
Detroit, Mich.

## Powerful Accurate Efficient



### 34-in. Vertical Turret Machine

Fitted with either
Plain Table, 3-Jaw Combination or 4-Jaw
Independent Chuck

Motor or Countershaft Drive

**Rogers Machine Tool Co., Inc.**
Alfred, N. Y.

## Examine This Rapid, Accurate Milling Machine

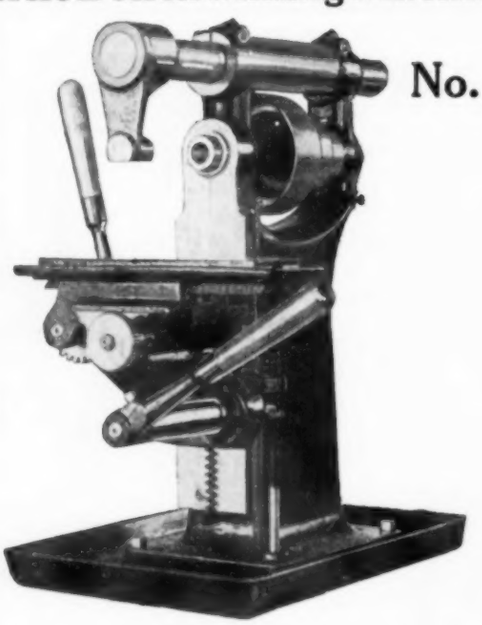
Motor driven, it has exceptional speed, which increases production and reduces costs.

Adjustable stops are conveniently placed for limiting vertical and horizontal movements at any position. Gears and shafting are all accurately cut and ground to standards. The column is of neat design, strong, rigid and with liberal bearing surfaces. Machine is guaranteed for a year.

There are so many good features about this Miller that we haven't the room to include them here, but do urge that you write in for a copy of the Wisconsin Bulletin for the complete story.

**Wisconsin Miller Mfg. Company**
Station A.
Milwaukee, Wis.

## Burke Bench Milling Machine No. 3

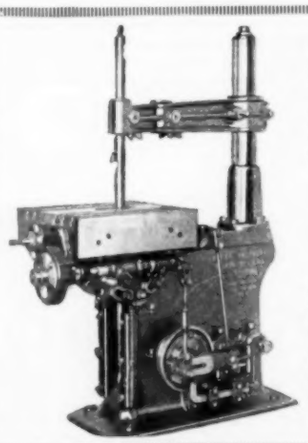


Speedy, accurate, compact. A serviceable, economical small machine for general use. Has slotting attachment, index centers, milling attachment, etc.

**Catalogue M lists full line of Milling, Drilling and Tapping Machines and Attachments. Send for it.**

**The Burke Machine Tool Co., Conneaut, Ohio**

**Foreign Representatives:** G. H. Alexander, Birmingham, England; Glaenzer & Perreaud, Paris, France; Riccardo Grisi, Milano, Italy; Wm. E. Peck & Co., Australia and New Zealand. (104 Pearl Street, New York City.) E. Isbecque, Brussels, Belgium.



## Accurate Keyseats

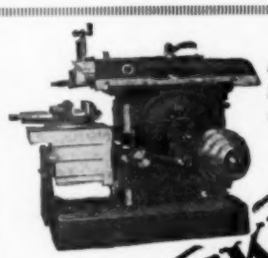
An inaccurate keyseat may easily cause an expense in fitting that will equal the cost of cutting a great many keyseats.

## BAKER Keyseaters

insure your keyseats being cut with maximum accuracy. These machines operate on the draw-cut principle. They are rapid producers.

Ask us to mail you a copy of our Bulletin on Keyseaters and Slotters.

**BAKER BROTHERS**
Toledo, O., U. S. A.



**16, 18, 20, 24 and 26-in. sizes. Same High Quality.**

## STOCKBRIDGE SHAPERS

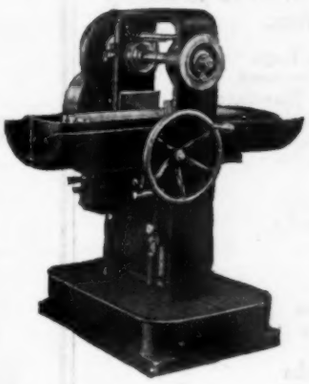
*Write for Bulletin*

**The Stockbridge Machine Co.**
Worcester, Mass.

# Rigidity under the heaviest cuts

Note the solid arch in this machine. There is rigidity under any strain of speed or feed that high speed steel can stand.

This is only one of the points that make this miller especially capable in manufacturing. Long runs of gang milling and other jobs of heavy and constant stress, show up the Briggs in its true colors.



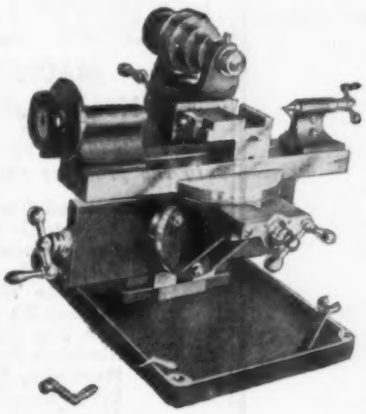
**Gooley & Edlund, Inc.**
**Cortland, New York**

DOMESTIC AGENTS: The Cleveland Tool & Supply Co., Cleveland, Ohio; Blackman-Hill-McKee Mchy. Co., St. Louis, Mo.; Chandler & Farquhar Co., Boston, Mass.; Vandyck Churchill Co., New York, N. Y., and New Haven, Conn.; Monarch Machinery Co., Philadelphia, Pa.; Syracuse Supply Co., Syracuse, N. Y.; Q. R. Adams, Rochester N. Y.; Brown & Zortman Machinery Co., Pittsburgh, Pa.; English & Miller Machinery Co., Detroit, Mich.; Federal Machinery Sales Co., Chicago, Ill.; Vonnegut Machinery Co., Indianapolis, Ind. FOREIGN AGENTS: C. W. Burton, Griffiths & Co., Ltd., London, Manchester and Glasgow; Andrews & George Co., Tokyo.

OVER-SEAS REPRESENTATIVE
ALMACOA ALLIED MACHINERY COMPANY OF AMERICA ALMACOA
51 CHAMBERS ST. NEW YORK, U.S.A.

Paris, Turin, Zurich and Barcelona





# Model Making

and experimental work demands a greater degree of accuracy than that required in ordinary manufacturing. Small gauge work, milling cutters and reamers must likewise be precise. The

# S&C Bench Miller

is the up-to-date machine tool for turning out this class of work with speed and accuracy. This machine can be furnished with a 36-inch pedestal if desired. The special feature of this miller is the table. It can be moved to any angle—horizontally or vertically.

Our circulars are interesting—send for them.

**Sloan & Chace Mfg. Co., Ltd.**
**6th Ave. and No. 13th St., Newark, N. J.**

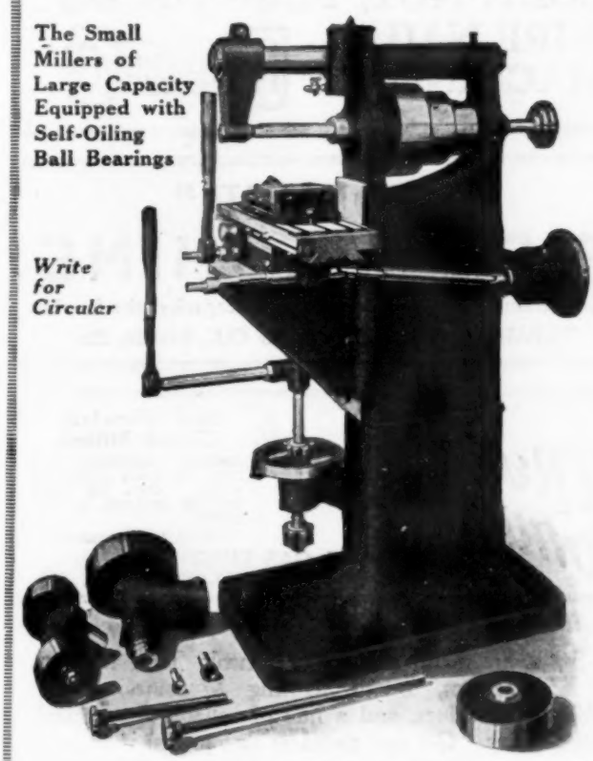
Manufacturers of Precision Machinery, Bench Lathes, Drill Presses, Milling Machines, Gear and Pinion Cutters, Tools, Fixtures and Gauges.



# Chicago Small Milling Machine

**The Small Millers of Large Capacity Equipped with Self-Oiling Ball Bearings**

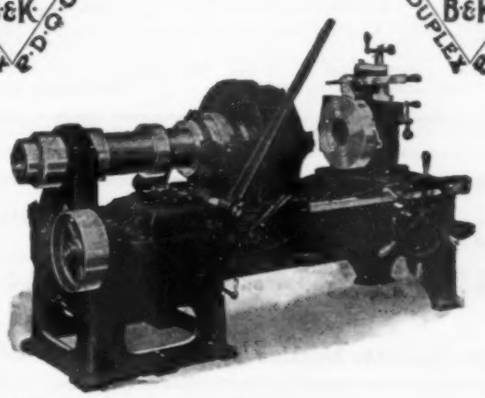
*Write for Circular*



**Chicago Machine Tool Co.**
**647 Washington Blvd., Chicago, Ill., U. S. A.**



PEERLESS B&K DUPLEX P·D·Q·D PEERLESS B&K DUPLEX P·D·Q·D



# Rapid and Accurate Pipe Threading

Is the kind done by B & K Pipe Threading Machines. They work with remarkable rapidity and ease of operation. Every thread is clean and accurate. Every machine is equipped with the Peerless Die Head. Made in nine sizes, each size having a capacity of 8 to 10 sizes of pipe.

**Write for complete catalog**

PEERLESS B&K DUPLEX P·D·Q·D

**Bignall & Keeler Machine Works**
**Edwardsville, Ill.**

PEERLESS B&K DUPLEX P·D·Q·D

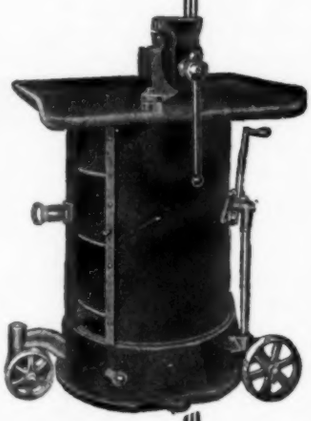
# NEW BRITAIN

**MACHINE COMPANY**

**New Britain, Conn., U. S. A.**

*Please send us complete information pertaining to the products checked below.*

- Pressed Steel Bench Legs
- Adjustable Bench Drawers
- Bench Countershaft Standards
- Adjustable Shop Stools
- Portable Work Stands
- Blacksmith Tool Racks
- Pan Top Racks
- Skeleton Frame Racks
- Revolving Screw Racks
- Pivot Base Racks
- Vise Stands
- Scraping Tables
- Soda Water Feeders
- Portable Lathe Pans
- Bar Stock Racks
- Screw Machine Racks
- Shop Shelving
- Permanent Ladders
- Machine Guard Stanchions
- Nesting Tote Boxes
- Stacking Tote Boxes
- Drop-Head Polishing Machine



*Name* .....

*Address* .....

**SHOP FURNITURE**

---

**Libby Turret Lathe**

A superior machine made by a man who is familiar with machine shop requirements. Machine is strong, powerful and rigid. Adaptable to entire range of heavy bar and chuck work. Let us give you full details.

International Machine Tool Co. Indianapolis, Ind.

---

Send Us Your Inquiries for

**BOLT, NUT, FORGING AND WIRE NAIL MACHINERY**

THE NATIONAL MACHINERY CO. TIFFIN, OHIO, U.S.A.

---

**COLUMBIA SHAPERS**

**Newer and Better**

Heavy Duty Shapers of unusual merit. 16, 20, 24 and 28-inch.

***Write us for details***

**The Columbia Machine Tool Co., Hamilton, Ohio**

---

**"STOEVER" PIPE MACHINE**

The machine with 25 per cent. greater capacity, size for size

**TREADWELL ENGINEERING CO., Easton, Pa.**

---

**Enlarge Your Working Capacity the "Davenport" Way**

The wide range of screw machine jobs and the large output made possible on the Davenport Multiple Spindle Automatic Screw Machine, enlarges the working capacity of any shop having this kind of work to do.

There's no sacrifice in accuracy or finish to get the "Davenport" output.

Many users say that they have taken on business which could never be touched under old production costs.

Let us send you our Catalog. Now?

**Davenport Machine Tool Co., New Bedford, Mass.**

---

*A New Way to Mill Threads*

**Hall Planetary Thread Millers**

Reduces threading cost 50% on some classes of work. Cuts all style threads internal or external.

*Write for particulars.*

**THE HALL GAS ENGINE CO.**
**BRIDESBURG, PHILADELPHIA, PA.**

---

**SHAPERS**

**Smith & Mills Company**
**Cincinnati, Ohio U. S. A.**

Foreign Agents—C. W. Burton, Griffiths & Co., London. G. & F. Limbourg, Freres, Brussels. Van Reitschoten & Houwens, Rotterdam. Gleanzer Perreaud & Thomine, Paris. Stussi & Zwiefel, Milan.

---

WE are manufacturers of Lincoln Type Milling Machines, Bench Milling Machines, Hand Milling Machines, and a line of reliable Screw and Lever Vises. Get our circulars and prices.

**THE CARTER & HAKES MACHINE CO.**
**Winsted, Conn., U. S. A.**

# IN A MINUTE

You Can Mill

# KEYSEATS

with this tool. Save fifty to seventy-five per cent. in time. Small first cost; save more in operation. Mills all keyseats alike—no filing or fitting of keys required. This tool is an attachment for the drilling machine and is fitted with a high-speed steel rotary cutter that mills internal keyseats in one cut.

**Write for Catalog D.**

**NATIONAL MACHINE TOOL COMPANY**

**2270-2272 Spring Grove Ave., Cincinnati, Ohio, U. S. A.**

Exclusive agent for British Isles: Alfred Herbert, Ltd., Coventry, England. For Australia: R. L. Scrutton & Co., Ltd., Sydney, Australia. For Canada: The Canadian-Fairbanks Morse Co., Ltd.

# "Cleveland" Open Side Planers

Any size from 30 in. to 72 in., any length.

*Write for the descriptive matter.*

**See first issue of each month for illustrations.**

**Cleveland Planer Co.**
**Cleveland, Ohio**
**Established 1900**

# CLEVELAND

## Horizontal Boring Milling and Drilling Machine

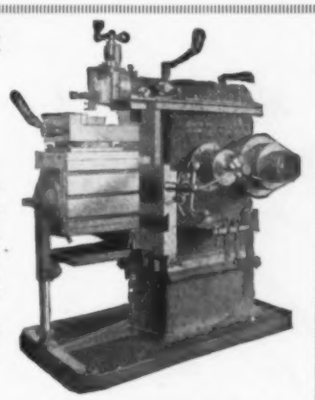
Find out about this rigid, powerful, rapid producing, thoroughly modern machine. Centralized control makes easy operation. Adjustments against wear.

***We'll be glad to send details***

**The Cleveland Machine Tool Co.**
**Cleveland, Ohio**
**Established 1907**

Both tool room and general manufacturing work may be speedily and accurately produced on the

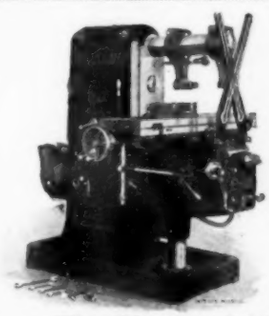
## SELLEW Double Purpose SHAPER



You can tell at first glance that it is no ordinary toolroom proposition. The extra height shows this fact. The capacity — obtained mainly by this height—is increased in the Sellew for handling larger work. More room is permitted and greater vise range. Other adjustments have been increased to a maximum without impairing the convenience of operation.

**We'll be glad to tell you what this machine can do for you in your shop. Send for details today.**

**Sellew Machine Tool Company, Pawtucket, R. I., U. S. A.**



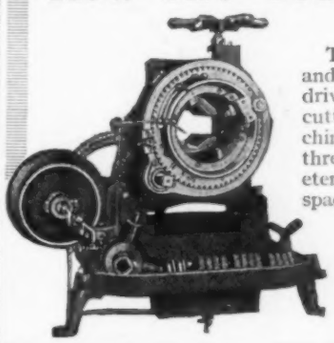
We are manufacturers of Milling Machines, Milling Cutters, Universal Relieving Machines, Special Tools, Profile Grinders and Plain Vises.

*Write for information about any you are interested in before buying elsewhere—*

**The Cleveland Milling Machine Co.**
**Cleveland, Ohio**
*Write for Our Stock List of Cutters*

**New York Office: 1760-2 Woolworth Bldg. Indianapolis Office: 316 Terminal Bldg. Detroit Office: 705 Dime Bank Bldg. Pittsburgh Office: 203 Oliver Bldg. Chicago: 435 Stock Exchange Bldg.**

# How Are You Threading Your Pipe?

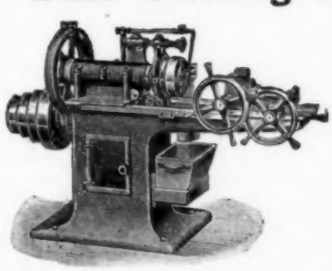


The Forbes Pipe Cutters and Threaders are motor driven, semi-portable pipe cutting and threading machines which cut and thread up to 12 in. diameter. It takes less floor space than most machines —Saves Power—

**Write for our Catalog.**

**The Curtis & Curtis Co.**
**66 Garden St., Bridgeport, Conn.**

# Bolt Cutting At Higher Speeds



Many ingenious devices add to the working range and speed of the Acme Bolt Cutters.

Power is transmitted to working parts in a way to cut out the lost motion, thus making every movement productive without unnecessary wear.

All materials are the best for its service.

Write for Catalog which shows our complete line.

**The Acme Machinery Company**
**Cleveland, O., U. S. A.**

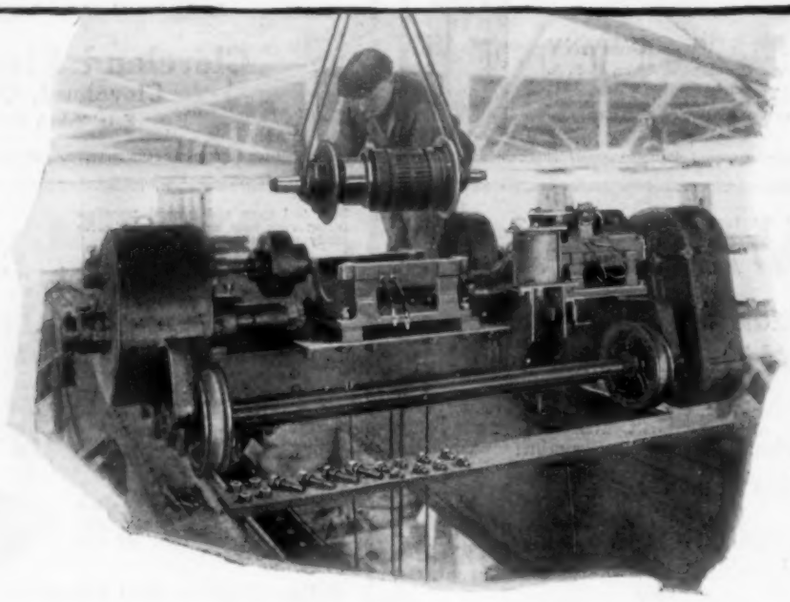
## Steptoe Shapers and Milling Machines

are built with a knowledge gained thru seventy-four years of experience in the manufacture of high-grade machine tools. Thousands of our machines are daily giving satisfaction, a recommendation for our product that should not be overlooked when buying new equipment.

***We would appreciate your inquiry.***

**THE JOHN STEPTOE COMPANY**
**Northside, Cincinnati, O.**

***Users of motors have indicated a preference for motor construction that permits severe service, easy repairs and minimum attention.***



## The Easily Disassembled Motor

CO-1800 Motors are meeting every requirement of users in severe service throughout many industries.

These CO-1800 Motors require minimum attention. A glance through the large hand-hole in top half of frame shows brushes are right and commutator bright. Another glance at the bearings through the large bearing covers shows plenty of oil and oil rings working properly. A touch of the hand shows the motor is running cool.

It's easy to open up these motors. Taking out a few bolts releases the top half of the frame, permitting the armature and bearings or fields to be removed without disturbing gearing. You can even take a shaft out without disturbing commutator and armature assembly.

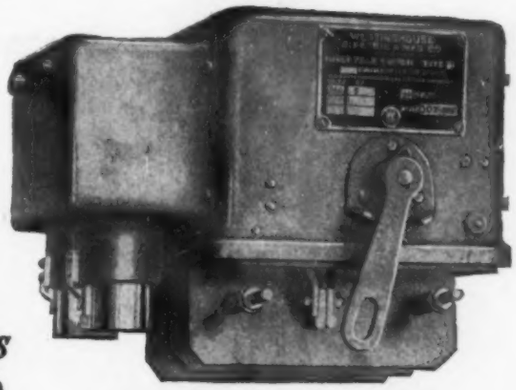
Bulletin No. 48100 will show you details of construction which have made the above features and service record possible.

**General Electric Company**

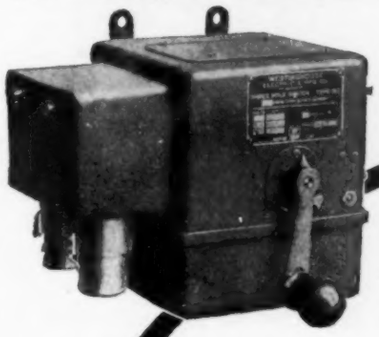
General Office Schenectady, N.Y.

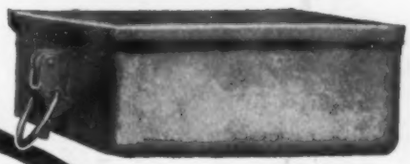
43-158

# —And Now The Type 815—



*Starting Switch for Squirrel Cage Motors from one-half to 10 Horsepower*





Now that this switch is available at moderate cost, you will not need to worry along with the drawbacks of the old knife switch.

## What Type 815 Does—

—PROTECTS THE MOTOR AGAINST OVERLOADS.
—PROTECTS BOTH MAN AND EQUIPMENT AGAINST ACCIDENTAL STARTING OF MOTOR SHOULD POWER UNEXPECTEDLY RETURN.
—LOWERS THE FIRE RISK.
—HELPS TO LOWER MAINTENANCE COSTS.

**Quick Make and Break**—When once started in either opening or closing direction, action of contacts is automatic and instantaneous, and cannot be stopped or retarded.

**Rolling Contacts**—Arcing is confined to the tips of contacts. The rolling action of contacts prevents roughing or pitting of the contact seats. A strong spring holds contacts firmly in closed position.

**Current-Carrying Parts Enclosed**—This precautionary measure safeguards the employee.

**Conduit or Open Wiring**—Knockout Holes in top and back.

**Accidental Starting of Motor Prevented**—Hand reset protects workman and equipment against accidental starting of the motor.

**Rid of the Oil Nuisance**—Switch fitted with asbestos-lined tank and asbestos barriers so that oil need be used only when presence of explosive gases makes it necessary.

***Ask for Descriptive Leaflet 1441-A.***

WESTINGHOUSE ELECTRIC & MANUFACTURING CO.
East Pittsburgh, Pa.

W
WESTINGHOUSE ELECTRIC

# Westinghouse

## They Stand Hard Service

Type T Reliance Motors are built to stand hard service and to stand it longer than the ordinary motor. Results have proved that they do. They represent the combined experience of 35 prominent electrical engineers in the big steel mills and machine shops.

Type T motors are supplied for both constant and adjustable speed service.

*Bulletin 2014 gives details.*

**Reliance Electric & Engineering Co.**
1044 Ivanhoe Road, Cleveland, Ohio

BRANCHES:
Boston New York Philadelphia Pittsburgh Chicago

Type T Heavy Duty
RELIANCE MOTORS
*Direct Current*

# BLACK & DECKER

Portable Electric Drills
*"With the Pistol Grip and Trigger Switch"*

0-7/8" DRILL

A Powerful, durable tool for heavy work.

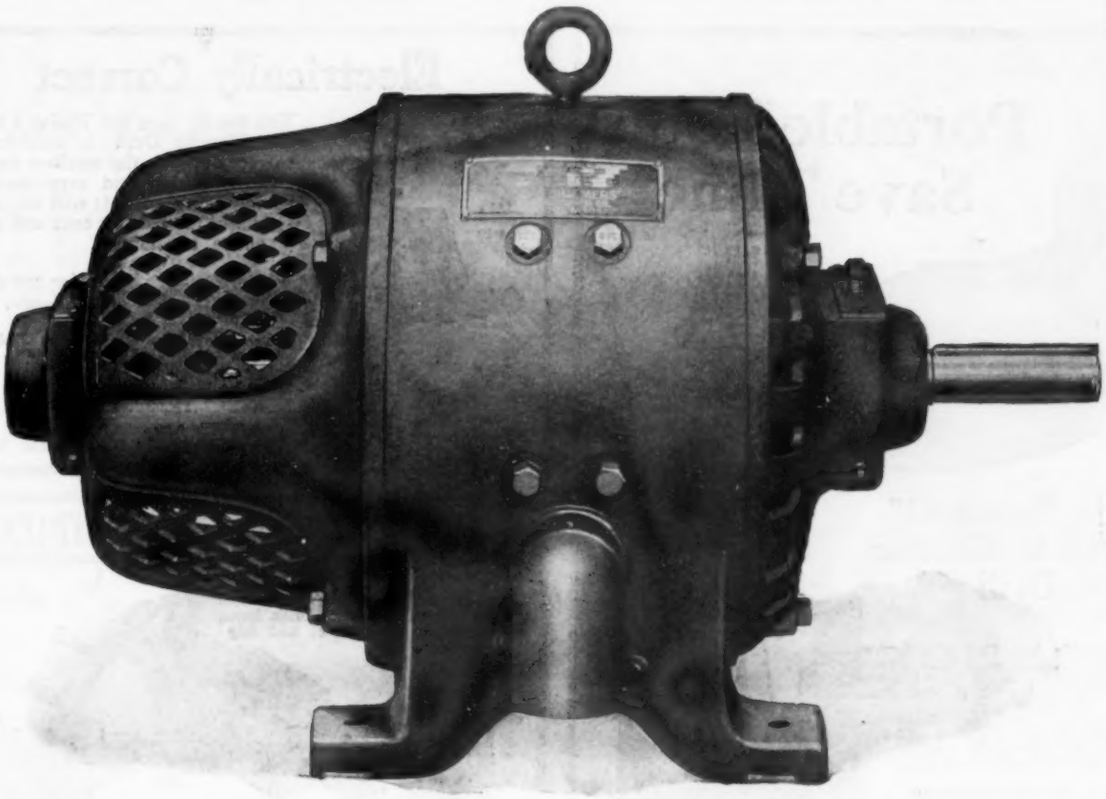
Like the rest of the Black & Decker Drill Family, it uses any current from Direct to 60 cycle Alternating. Gears run in grease like an Automobile transmission.

Made in 3/16", 1/4", 3/8", 1/2" and 7/8" sizes for steel.

*May we send you complete information?*

THE BLACK & DECKER MFG. CO.
145 S. CALVERT ST.
Baltimore, Md., U. S. A.

*Portable Electric Drills*
*Electric Valve Grinders*
*Electric Air Compressors*



# *The New Motor*

*Allis-Chalmers "Type E"*

## *For Machine Tool Drive*

IMPORTANT FEATURES

**Ratings and speeds corresponding to standard 60 cycle induction motors.**
**A complete line of constant and adjustable speed ratings.**
**Rugged cast steel yokes.**
**Commutating poles, insuring sparkless commutation.**
**Dust-proof bearings.**
**Windings treated to resist oil and moisture.**
**Thorough ventilation.**
**Conduit terminal boxes on all motors.**
**Improved box type brush holders.**
**Standard enclosing covers.**
**Interchangeable parts.**
**All parts easily accessible.**

***New Bulletin Now Ready—Send for Your Copy.***

**ALLIS-CHALMERS MANUFACTURING COMPANY**
Milwaukee, Wisconsin, U. S. A.
*District Offices in All Leading Cities*

ALLIS-CHALMERS PRODUCTS
Electrical Machinery
Steam Turbines - Steam Engines
Gas and Oil Engines
Hydraulic Turbines
Crushing and Cement Machinery
Mining Machinery
Flour and Saw Mill Machinery
Power Transmission Machinery
Pumping Engines - Centrifugal Pumps
Steam and Electric Hoists
Air Compressors - Air Brakes
Agricultural Machinery
Condensers

# Portable Tools Save Time

## "The Standard" Portable Electric Drill

is a portable tool that will prove invaluable around your busy shop. Your workmen can get in the most awkward places with it and drill quickly and accurately. Many automobile manufacturers have endorsed this portable drill for reducing manufacturing cost. Let us tell you why.

*Write for Complete Details.*

**The Standard Electric Tool Co.**

**Cincinnati, Ohio, U. S. A.**

# Electrically Correct

You can be sure the Willey Portable Electric Drill is electrically correct down to the smallest detail. Our reputation and experience is behind every one. It will stand up under the hardest tests and give entire satisfaction.

*Write for our drill catalogue.*

Foreign Representatives: Buck & Hickman, Ltd., London, Eng. Bevans & Edwards, Melbourne, Australia. Alfred Herbert, Ltd., Yokohama, Japan.

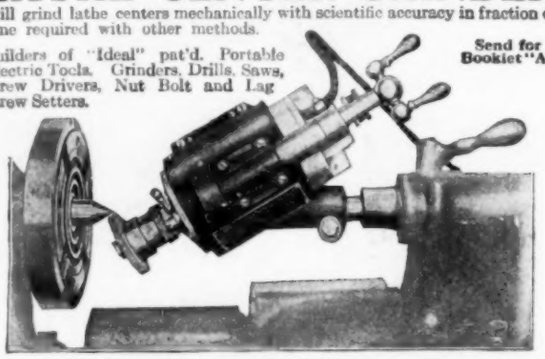
**James Clark, Jr. Electric Co., Inc.**
521 W. Main St., Louisville, Ky.
Chicago, 33 N. Jefferson St.

# LATHE CENTER GRINDER

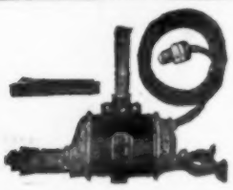
Will grind lathe centers mechanically with scientific accuracy in fraction of time required with other methods.

Builders of "Ideal" pat'd. Portable Electric Tools. Grinders, Drills, Saws, Screw Drivers, Nut Bolt and Lag Screw Setters.

Send for Booklet "A"



**The Neil & Smith Electric Tool Co., Cincinnati, O., U. S. A.**

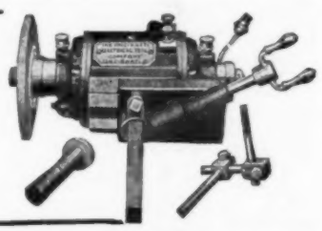


## Electric Hand Drills

Made in 12 sizes, ¼ to 2 in. capacities. Hand, Screw Feed, Radials and Bench Drills, Ball and Thrust Bearings.

## Tool Post Grinders

¼ to 3 H. P. Weight from 16 pounds up. Free hand feed. Bearings adjustable to wear. Horizontal and vertical feeds. Different types for all purposes. Also Bench and Floor Grinders



**Cincinnati Electrical Tool Co., Cincinnati, Ohio**
New York Office, 50 Church Street

BUILT FOR YOUR LABOR-SAVING DEVICE

BOSTON **Holtzer-Cabot** CHICAGO

FRACTIONAL H.P. MOTORS

CROCKER-WHEELER MOTORS

"Niagara's Rival for ... Dependable Power"

**CROCKER-WHEELER CO.**
Ampere, N.J.

## Ransom Speed Controller

Automatically takes care of the overspeeding problem. Gives perfect control with speed variation up to 75-100%. Cannot possibly fail as long as the motor runs.

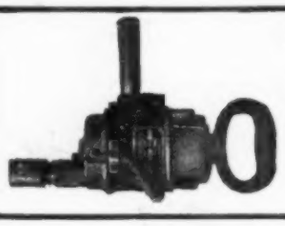
**Ransom Mfg. Co., Oshkosh, Wis.**

For Every Industrial Requirement

WILLSON GOGGLES

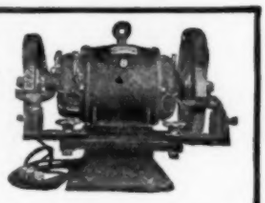
Write for Catalog

**T. A. Willson & Co., Inc., Factory and Main Office, Reading, Pa.**



## Expensive Equipment Is Not Always Necessary

Take U. S. Electric Tools to the work and save four-fifths of the time usually required on each job. Every kind of portable drill, grinder and buffer ready for prompt delivery. Write for Catalog.



**THE UNITED STATES ELECTRICAL TOOL CO., Cincinnati, Ohio**

*New York Office*, 50 Church St.
*Chicago Office*, 549 W. Washington Blvd.
*Detroit Office*, 18 W. Columbia St.
*Philadelphia Office*, Bourse Bldg.
*Boston Office*, 12 Pearl St.
*St. Louis Office*, 610 Commercial Bldg.
*Cleveland Office*, 509 Guardian Bldg.

# Physical Fitness

Army and naval commanders know full well that only the healthy, well kept man can be relied upon in extreme emergencies. No expense is spared in either branch to promote sanitation.

The wise employer likewise knows that the installation of modern apparatus for the cooling and serving of drinking water will reflect in the quality of his product. A good mechanic appreciates cleanliness and remains loyal to the concern that takes interest in his comfort.

## Sanitary Bubbling Fountains

will help make your men stick. These fountains prevent the spread of contagious disease, so common with the "family" drinking cup. They furnish an ample supply of clean, cool drinking water and are most economical in both water and ice. Some of the largest manufacturers in this country have commented on the change made in their help by installing Sanitary Drinking Fountains. Can't you stand an increase in efficiency? Our fountains are equipped for erect or inclined streams.

**Send for complete catalog showing our line of Wash Bowls, Metal Lockers, All Steel Stools and Chairs with Inset Wood Seats, Stock and Storage Racks, Metal Shelving, Metal Vault Fixtures, Improved Soda Kettles, 40 and 60 gallons, Water Heaters and Instantaneous Mixers, Bubbling Drinking Fountains, Work Benches and Bench Legs, Drawing Stands and a full line of plumbing material. Prompt shipment. See our other advertisement also in this issue.**

**Manufacturing Equipment & Engineering Co.**
136 Federal Street, Boston, Mass.
Works and Mail Address Birmingham, Mass.

# WARD'S Steel Tubing

# Seamless Tubing

2,000 Sizes.

3,000,000 feet on hand at all warehouses.

*Stock Lists Issued Every Two Weeks*

***Are You on Our Mailing List?***

**Write Nearest Office**

## EDGAR T. WARD'S SONS CO.

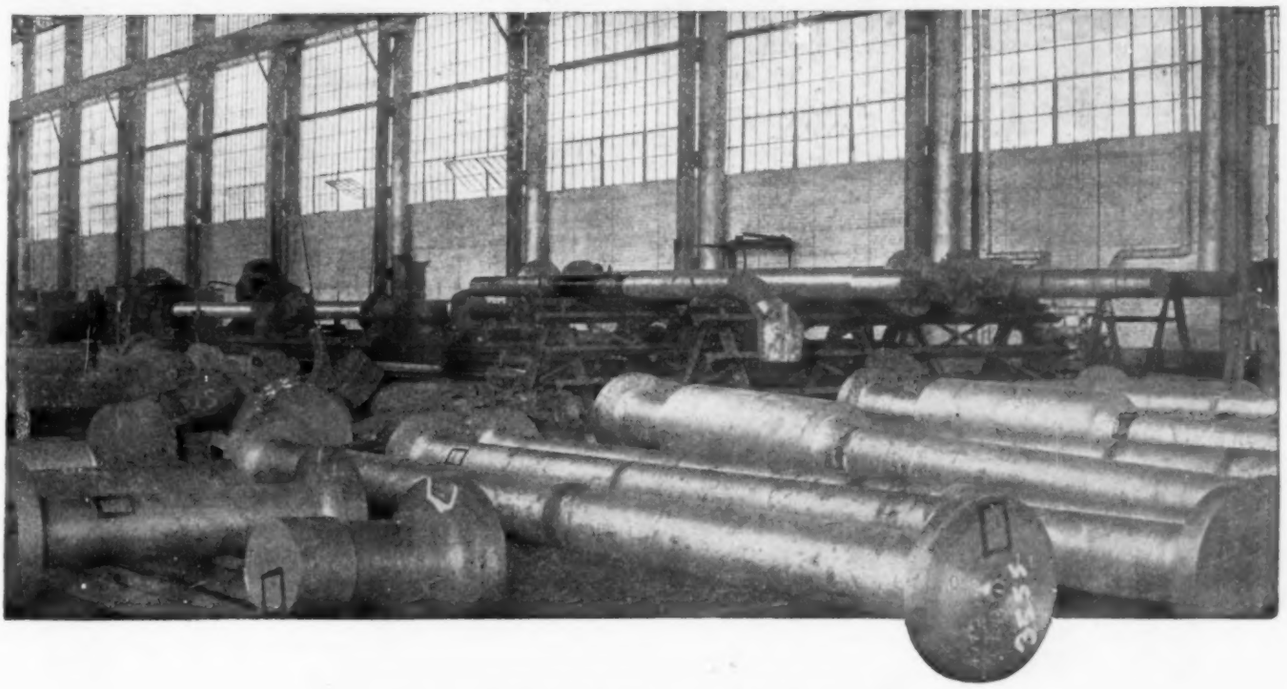
OFFICES AND WAREHOUSES

BOSTON 40-54 FARNSWORTH ST. | NEW YORK 304 HUDSON ST. | NEWARK 394 FRELINGHUYSEN AVE. | CHICAGO 3604 SOUTH MORGAN ST. | PHILADELPHIA 16th & INDIANA AVE.

BRANCH SALES OFFICES

CLEVELAND 416 CITIZENS' BLDG. | DETROIT 403 VINTON BLDG. | MILWAUKEE 505 FIRST NATIONAL BANK BLDG. | ST. LOUIS 418 COMMERCIAL BLDG.

# CAMDEN



# DON'T STOP

to wonder whether we can make your forgings.

## CAMDEN FORGINGS

are made for innumerable purposes.

We are interested in knowing of your forging requirements. We know that we can interest you in our plant and its product.

Let these considerations lead to our receipt of your forging inquiries.

### *BUYERS' MEMO*

- High and Low Carbon Bars
- Press Columns and Rams
- Full Back Cylinders
- Water Cylinders
- Valve Bodies
- Plungers
- Weldless Steel Rings
- Lathe Spindles, solid and hollow bored
- Long Feed Screws
- Power Press Crank Shafts
- Rudder Arms
- Rudder Stocks
- Cam Shafts
- Eccentric Shafts
- Crusher Shafts
- Gear and Pinion Blanks
- Locomotives: Side and Main Rods; Crank Pins; Axles; Rod Straps; Guides; Parts of frame both in iron and steel
- Hammered Iron Bars for locomotive repairs
- Marine Shafts
- Marine Connecting and Eccentric Rods
- Rolls: Bending; Feed; Straightening; Embossing
- Large Wrenches
- Saw Arbors
- Steam Engine Forgings
- Pump Crank Shafts
- Pump Connecting Rods
- Large Nuts
- Turbine Shafts
- Mill Shafting
- Trolley Car Axles
- Electric Motor Axles
- Any forging to your print, and specifications, in either iron or steel.

# CAMDEN FORGE CO.
## CAMDEN, N.J., U.S.A.

# The Works behind the Label -

We never reach heights above our habitual thinking. It is the atmosphere we create for ourselves in thought that permeates and perfects what we do. The knowledge born of long experience that our product is the high speed steel par excellence fills the atmosphere of our plant with an ideal that every operative breathes. "Red Cut *is* the best and, therefore, it ***shall*** be the best" is the driving force that makes.

# "Red Cut Superior"

THE NATIONALLY KNOWN—FIRST QUALITY

## HIGH SPEED STEEL

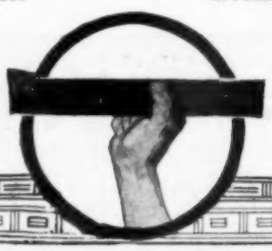
THE BEST FOR ALL MACHINE WORK

## VANADIUM-ALLOYS STEEL CO.

General Sales Offices: Pittsburgh, Pa. Works: Latrobe, Pa.

BRANCH OFFICES:

BUFFALO, BOSTON, CLEVELAND, CHICAGO, CINCINNATI, DETROIT, NEW YORK, PHILADELPHIA, PITTSBURGH, TORONTO, MONTREAL



# LUDLUM STEEL

## Consistently Uniform

**Mohawk Extra**
High Speed Steel

**Pompton**
Carbon Tool Steel

**Albany**
Alloy Tool Steel

**Oneida**
Oil Hardening Tool Steel

**Huron**
Alloy Die Steel

**Teton**
Ball Bearing Steel

**Seminole**
"Fool Proof" Chisel Steel

**Yuma**
Chrome Magnet Steel

**No. 1**
Ludlum Steel

After Ludlum Steel has undergone its *first* rolling or cogging, the bars are sheared to length. Then they are again heated and prepared for further reduction by rolling. They are then annealed, inspected, and those that pass the various rigid examinations and tests are ready for shipment.

And to where do they go? They go to the majority of large users and twist drill and milling cutter manufacturers in America, for these—the most particular users of high speed steel—demand "Ludlum".

*We are prepared to tell you* ***why****—just ask us.*

## Ludlum Steel Company

**General Offices and Works:**
**WATERVLIET, N. Y.**

*Branch Offices:*
**New York City Philadelphia Cambridge Cleveland**
**Cincinnati Detroit Chicago Buffalo**

# STEEL

**COMPRESSED STEEL** in flats, squares, rounds, hexagons, channels, angles and special shapes.

We have established an enviable reputation as manufacturers of a superior article and consumers agree that our product has no equal in accuracy and finish. Why? Because our steels have parallel sides, sharp corners and are finished to micrometer measurements. You will save by adopting our quality steel.

**SPECIAL SHAPED BAR** is formed by appliances designed by ourselves and is guaranteed to micrometer size and perfect in finish. Sharp, beveled or rounded corners as required.

Let us quote on your quantity specifications.

**COLD DRAWN SCREW STOCK** is our specialty. We furnish this material accurate to size and it is guaranteed to be free-cutting—suitable for use in high-speed automatic screw machines. We furnish either Bessemer or Open Hearth Screw Stock quality.

**SHAFTING.** We can furnish Finished Shafting up to and including 5 in. diam. Our productive facilities embrace the most up-to-date appliances for finishing rounds—straight and guaranteed to size. We can furnish all standard sizes of shafting reasonably prompt and are prepared to contract for future delivery.

**We also Manufacture—**

***Compressed Steel Elevator Guides, Connecting Rods, Crank Shafts, Finished Machine Keys, Machine Rack, Feed Screws, Lead Screws and Worms***

***Send for Catalog embracing our line***

## Standard Gauge Steel Co.
## Beaver Falls, Pa.

# Brubaker Bulletins

*being a series of quality features—each ably upholding Brubaker repute*

## 20% more holes

Economical production is a big issue with modern manufacturers. Any tool that will produce in a satisfactory manner over a longer period is the one in demand. That is why

## Brubaker

***Special Tempered***
***Relieved***

## Staybolt Taps

are found to be the choice in quality shops. They will tap a good 20% more holes. This feature is due to their special temper. This same temper allows speedier operation without breakage danger, which counts for much in a day's output. Every tap in every Brubaker shipment is guaranteed to size. A Brubaker job is therefore a uniform job—no retapping nor rethreading. Send for literature and note *all* Brubaker features.

**The Tap with the "Continuous Taper."**
A method by which you can't tell where the taper thread enters the straight thread, thereby producing a uniform cutting edge which distributes the work.

# W.L. Brubaker & Bros.
## 50 Church St., New York.

# No Corrosion

There is no corrosion in Eclipse Seamless Steel Pots. That bugbear of cast-iron pots is eliminated. Besides, this is only one of the superior features Eclipse Pots possess.

The furnace has a greater capacity when fitted with a steel pot. Drawn steel pots have the same sectional dimensions throughout their entire length, while cast-iron pots must be made much smaller at the bottom. The metal in the steel pots is thinner and offers much less resistance to the passage of heat than the heavier cast-iron pots. Another advantage of Eclipse Seamless Steel Pots is their high melting point.

***Eclipse Steel Pots quickly pay for themselves in gas savings. Write today for Circular giving a complete description.***

**Eclipse Fuel Engineering Co.**
**Rockford, Ill.**



# We Wish You to Know

why gears cut from

## Carnegie Rolled Steel Blanks

are better.

The steel is first rolled into cylindrical blooms. This process of rolling forces the best quality steel to the rim where it will encounter the most severe service—and further insures throughout a close grained, homogeneous structure—a structure obtained after long years of experience and experimentation.

These cylindrical blooms are then cut into small disks, from which are made Carnegie blanks and rings. Gears cut from these blanks are the latest word in effective gearing. They outwear cast steel gears three or four times.

Just as the iron gear has replaced those of wood, and the cast steel gear those of iron, so do rolled steel gears replace cast steel gears. For real service and real quality, insist on gears cut from Carnegie Rolled Steel Gear Blanks—the Gears of Quality—the Gears for Service.

**Carnegie Steel Company**
General Offices: Carnegie Building, Pittsburgh, Pa.

# CYCLOPS
# STEELS

High Speed Steels
Alloy Tool Steels
Carbon Tool Steels

**CYCLOPS STEEL CO.**
120 BROADWAY NEW YORK CITY

WORK:
TITUSVILLE, PENNA.
CLEVELAND DETROIT CHICAGO

# MIDVALE
## EXTRA HIGH SPEED STEEL

A new edition of this book containing much additional valuable information is now in press and is promised for distribution this month. Send us your name and address and a copy will be mailed to you as soon as ready.

**MIDVALE STEEL AND ORDNANCE COMPANY**
**CAMBRIA STEEL COMPANY**

*General Sales Office*, Widener Building, Philadelphia, Pa.

*District Sales Offices:* Atlanta Boston Chicago Cincinnati Cleveland Detroit New York Philadelphia Pittsburgh San Francisco Salt Lake City Seattle St. Louis

CONSOLIDATED STEEL CORPORATION, 165 Broadway, New York, is the sole exporter of our commercial products. Address all export inquiries to them.

*Series Number 15-G.*

# MOLTRUP

***Cold Drawn, Free Cutting***
**Hexagon Screw Steel**

If you manufacture machine screws, meets the demand for accuracy and straightness in screw machine stock. spark plugs, bolts, nuts, etc., Moltrup will satisfy. We also carry flats, rounds, squares, special shapes and machine keys.

***Write for stock list and prices.***

**Moltrup Steel Products Co.**
**Beaver Falls, Pa.**

New York Office, Woolworth Building. Central Steel & Wire Co., Chicago and Detroit. Union Iron & Steel Co., Cincinnati. Miner-Morse Corp., Erie, Pa. H. D. Cushman Company, Cleveland. Milton Pray, Monadnock Building, San Francisco, Alaska Building, Seattle, Wash. John W. H. Evans & Co., London, England.

**Steel Products**

# WELDING
**with**
## Alternating Current Electric Arc Portable Guaranteed Machines

We have machines for all kinds of work, and can show economy over other systems. *Recommended for the following work:*

**Boiler construction and repairs.**

**Ship construction and repairs.**

**Locomotive construction and repairs.**

**Tank manufacturing and repairs.**
(Especially tanks requiring absolute tightness)

**Pipe manufacturing and repairs.**
(Especially the introduction of odd-shaped tees and branches)

**Automobile construction and repairs.**

**Railroad line work and repairs.**

**Cutting of shell stock by nicking, and kindred uses.**

**Welding Wire (Bare and Covered) in stock at all times**

***Prompt Deliveries***

**Electric Arc Cutting & Welding Co.**
**222 Halsey St., Newark, N. J.**

# TOOL STEELS

Blue Chip

High Speed
*and other*
*FIRTH-STERLING TOOL STEELS*

THE knowledge, experience and skill of SHEFFIELD combined with the best PITTSBURGH practice have made these steels the standards of QUALITY and UNIFORMITY wherever Tools are used

FIRTH-STERLING STEEL COMPANY
*McKeesport, Pa.*
NEW YORK BOSTON PHILADELPHIA CLEVELAND
PITTSBURGH CHICAGO

# The Steel that gives the cut

Unsurpassed for special endurance, great strength and toughness. For turning, planing and slotting hard materials; for expensive Cutters, Drills, Forming Tools, Taps, Reamers, Punches, Dies, etc.

**"Hawk Special" Tool Steel**

is particularly suited. Where the speed is not excessive "Hawk Special" will take the place of High-Speed Steel to good advantage.

We can supply steel of almost any size and shape, and for any purpose. Write today for our latest stock list. You will probably find in it just the steel you need. Prompt shipments made from our large stock.

**Hawkridge Bros. Co.**
303 Congress Street Boston, Mass.

# ACCIDENT INSURANCE

Your Plant Is Hedged About with All Possible Safeguards

EXCEPT:

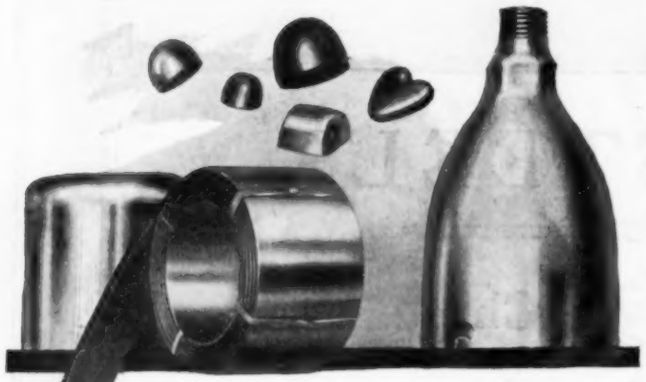
You will take unwarranted chances in making your shop tools.

Jessop's Tool Steel is Tool Steel plus Accident Insurance.

Your policy is hammered in every bar.
by using the Tool Steel *that does*

Diminish your mounting labor costs *not fail.*

**WM. JESSOP & SONS, Inc.**
New York
Branches and Stocks in All Principal Cities



**Performance of the Unusual with Our *Hot and Cold Rolled***

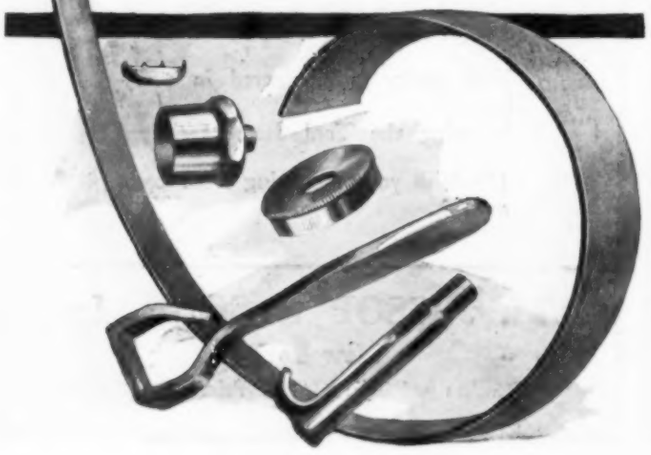
# Strip Steel

is an established fact. Material of absolute uniformity and high ductility assures best results for deep drawing, rolling, light and heavy stamping.

**JULIUS BLUM & COMPANY**

510-512 West 24th Street
New York, N. Y.

MILLS: BORDENTOWN, N. J.



HALCOMB "KETOS" TOOL STEEL OIL-HARDENING NON-SHRINKING

# "KETOS"
## An Original Product

No other steel put on the market since Huntsman invented the crucible process, early in the eighteenth century down to the present day, so successfully blends toughness, durability, cutting-power, density of structure, non-shrinking and non-warping properties, and, above all, safety in hardening, as does "Ketos" Oil Hardening Tool Steel.

Tools and master gauges which require a high degree of accuracy are hardened without movement.

*Have you read the "Keto Book"? It's free.*

## Halcomb Steel Company

Syracuse, New York

Manufacturers of High-Grade Crucible and Electric Furnace Steels

BRANCHES:
CHICAGO CLEVELAND DETROIT NEW YORK
PHILADELPHIA BOSTON HARTFORD

# STEEL
## WHEN YOU WANT IT

## LISTEN!

Aborn has the steel you require in Aborn warehouses, ready to mark and ship "immejit," and always at the right price. That's enough to know, isn't it

A FEW STOCK ITEMS

| | |
|---|---|
| High Speed Steel | Tool Holder Steel |
| Oil Hardening Steel | Vanadium Steel |
| Chrome and Nickel Steels | Annealed Punch and Die Steels |
| Tool and Drill Steels | Spring Steels |
| Pick, Wedge and Hammer Steels | Machinery Steels |
| Annealed Cutter Blanks | Drill Rods |
| Music Wire for Springs | Aborn Welding Wire |
| Cold Rolled Steels | Tempered Spring Wire |
| Forgings, Specialties | Drawn Steels, Iron |

**ABORN STEEL COMPANY, Inc.**

Century Crucible Steel Works
Ontario Electric Steel Works

36 Clarke St., New York, N. Y.

Boston, Mass. ..... 171 High Street
Buffalo, N. Y. ..... 520 Marine Trust Bldg.
Philadelphia, Pa. ..... 269 Drexel Bldg.
Pittsburgh, Pa. ..... 59 Conestoga Bldg.
Rochester, N. Y. ..... 133 Andrews Street
San Francisco, Calif. ..... 320 Market Street

223

# Columbia Steel & Shafting Co.

MILLS AND GENERAL OFFICES: PITTSBURGH, PA.

EASTERN SALES DEPARTMENT AND WAREHOUSE: BOSTON, MASS.

MANUFACTURERS OF

COLD DRAWN AND DIE ROLLED ROUNDS, HEXAGONS, SQUARES, FLATS, SPECIAL SHAPES, SCREW STOCK, AXLE AND ALLOY STEELS, "COLUMBIA" TURNED AND POLISHED STEEL SHAFTING

THE LARGEST AND MOST COMPLETE STOCK OF COLD FINISHED STEELS

Monthly Stock List Issued

## COLD DRAWN SPECIAL SHAPES

**Angles, Tees, Cutter Bars, Knife Backs, Bevel Edge and Cam Sections, Typewriter, Automobile and Special Machine Part Sections**

We are prepared to furnish, in the shortest possible time consistent with perfection in quality, a great many special shapes in accordance with specifications furnished. The accompanying illustrations will convey some idea of the irregular shapes we have made. The illustrations are intended only to show possibilities in the line of cold-drawn steel bar special shapes for manufacturing purposes.

Inquiries should be accompanied by drawing or sample section (the latter preferred), together with advices as to grade of material required, or the purpose for which it is to be used, and quantity involved.

SALES OFFICES: NEW YORK CHICAGO CLEVELAND DETROIT PHILADELPHIA WASHINGTON

# TOOLS EVERLASTING ARE MADE OF ELECTRITE URANIUM HIGH SPEED STEEL

Here's a high-speed steel which will wear longer and bite harder than others.

The secret lies in the correct combination of Uranium and Steel.

A trial is convincing. It means economy for you to be convinced.

LATROBE ELECTRIC STEEL

LATROBE CO. PENNA.

ONCE TRIED-ALWAYS USED

# Colonial High-Speed Steel

***Colonial shortens the Time and lengthens your Profit***

Bigger production is the sure route to Economy—the direct result of high speed work.

The toughness, the resistance of **Colonial High Speed Steel** makes it bite deep, finish smooth, cut fast. It shortens the time, it lengthens your profit.

**Colonial Steel Company**

Pittsburgh Boston Chicago St. Louis
New York Philadelphia Detroit

## DIE-CAST PARTS AND BEARINGS

*made from our various alloys of*

**ZINC, TIN, LEAD AND ALUMINUM**

**NATIONAL LEAD COMPANY**

111 Broadway New York, N. Y.

---

**STECO**

**CASE-HARDENING MATERIAL**

Let us ship you a month's requirements, and if it does not prove superior to your present material it **will cost you nothing.** We will be pleased to write you further.

**The Steel Treating Equipment Company**
*Metallurgical Engineers*
2081 West Lafayette Boulevard, Detroit, Michigan

---

## "SHELBY"

The Recognized Standard of
**SEAMLESS STEEL TUBING**
**For Mechanical Purposes**

*Ask for Booklet No. 103 for technical data on "SHELBY" Tubing*

NATIONAL TUBE COMPANY PITTSBURGH, PA.

---

TRADE **L-XX** MARK **HIGH SPEED STEEL**

Reg. U. S. Pat. Off.

**And other Tool Steel of Quality**

NEW YORK ST. LOUIS
DETROIT CHICAGO
PITTSBURGH BUFFALO

**ATLAS CRUCIBLE STEEL CO.**
Works and General Offices, Dunkirk, N. Y.

BOSTON TORONTO MONTREAL
CLEVELAND Executive Offices
MINNEAPOLIS BUFFALO

---

**Monel metal**

INCO MONEL METAL

Non-corrodible—strong as steel—tough and ductile. Withstands acids, high temperatures, erosive action of hot gases and superheated steam.

THE INTERNATIONAL NICKEL COMPANY
43 Exchange Place - - New York, N. Y.

---

**IMPERIAL WELDING AND CUTTING EQUIPMENT**
**OXY-ACETYLENE PROCESS**

A new mixing principle, a regulator that accurately controls gases, the greatest working range ever covered by ONE torch—are exclusive IMPERIAL features. Write for catalog.

**Imperial Brass Mfg. Co., 1214 W. Harrison St., Chicago**

---

## YOU ORDER! WE SHIP! NO WAIT!—

**WILLIAMS BRONZE**
**Ready Cast Bars and Bushings**

Williams Bronze is a STANDARD BRONZE for Bushings, Bearings, and Machine Parts. Two hundred sizes in stock always.
Order from the best supply houses or direct from

**E. A. WILLIAMS & SON, Inc., JERSEY CITY, N. J.**

---

---

Pattern and tool equipment for over 10,000 standard bushings and bearings—or any special designs as ordered. 107 compositions on file—alloys compounded with absolute accuracy. Quotations upon request.

**The Bunting Brass & Bronze Co.**
726 Spencer St., Toledo, Ohio.

---

**Oxy-Acetylene Welding and Cutting Apparatus**
**and High Grade Welding Supplies**

OXY-ACETYLENE WELDING DAVIS APPARATUS DAVIS-BOURNONVILLE CO. N.Y.

Highest efficiency in results and greatest economy in operation. Both gases under independent pressure; positive mixture; high pressure torch and neutral flame. Complete Plants for greatest requirements! *Write for* **Catalog, Bulletins and Supply Price List**

**DAVIS-BOURNONVILLE COMPANY**
**General Offices and Factory, Jersey City, N. J.**
**New York, Boston, Philadelphia, Pittsburgh, Cleveland, Cincinnati, Chicago, Detroit, St. Louis, Seattle, San Francisco, Los Angeles**

---

**2500 Tons American and Swedish Tool and Drill Steel in Stock**

*Alloy Steels for all purposes*

| | | | |
|---|---|---|---|
| High Speed Steel | Die Blocks | Drill Rod | |
| Swedish Welding Wire | Swedish Iron | Chain | Anvils |

**Federal Tool & Alloy Steel Corporation**
Successors to
Swedish Iron & Steel Corp., General Office, Woolworth Bldg., N. Y. City
Branches: Boston, Philadelphia, Cleveland, Chicago, Denver, New Orleans

---

**SCREW STOCK**

**SHAFTING — SPECIAL SHAPES**
**New England Deliveries**

**NEW ENGLAND DRAWN STEEL CO.**
MANSFIELD, MASSACHUSETTS

KEEN STRONG

WOLFRAM

MADE IN THE U.S.A.

HIGH SPEED STEEL TRADE MARK

**VULCAN CRUCIBLE STEEL CO.**

ESTABLISHED - 1900

Aliquippa, Pa., U.S.A.

High Speed-Carbon-Alloy Tool Steels

Bars Tool Bits

**Save That Scrap**

Let us convert it into

**HIGH ON SPEED STEEL**

We guarantee steel converted from your High Speed Steel Scrap to be equal in quality to any high speed steel you have ever used, if not, you may return it and we will pay you the market price for the weight of Scrap accepted by us.

*The only plant in the world devoted exclusively to High Speed Steel.*

**ONONDAGA STEEL COMPANY INC.**

SYRACUSE, N.Y. U.S.A.

**Union Drawn Steel Company of Beaver Falls, Pa.**

Makers of Bright Cold Finished Bessemer, Open Hearth and Crucible Steel, in Rounds, Flats, Squares, Hexagons and Special Shapes; straight, accurate to section, with polished superior wearing surface; for Shafting Duplicate Shafts for machine construction, piston and pump rods, keys, feathers, slides, and guides; Special, simple and alloyed steels, cold finished, for all special requirements, particularly adapted for rapid machining in screw machines, hand or automatic.

**Branch Offices and Warehouses**

Detroit Cincinnati Boston New York Buffalo Philadelphia Chicago

Brown Bros., Ltd., London, E.C.

**TIP-IT AND A HOME-MADE FURNACE WILL WELD TOGETHER THIS TOOL**

**TIP-IT INC.**

120 BROADWAY

NEW YORK CITY

**Saves Its Cost in a Few Months**

The Canton Portable Floor Crane and Hoist gets into the corners, picks up and carries any article weighing up to 4,000 lbs. and deposits it onto lathe, planer or truck bed, wherever it is required. The saving in man-strength and handling time soon pays for "Canton" equipment.

***Write for the "Canton Book" E-26.***

Canton Cranes are supplied with the Double Gearing when so desired, at a small extra cost.

**The Canton Foundry & Machine Co. Canton, Ohio**

Alfred Herbert, Ltd., Coventry, England.

**ARMCO IRON WELDING RODS**

99.84 per cent. pure iron. Uniform composition unsurpassed by any imported product. Two kinds of ARMCO Rods, one for electric and one for oxy-acetylene, handle all steel and iron welding. Flow freely and make toughest possible joint. Send for booklet of handy welding data.

**PAGE STEEL & WIRE CO.**

**Sales Offices: 30 Church St., New York**

**Chicago, 29 South La Salle Street. Detroit, Book Building. San Francisco, American Rolling Mill Company of California. Canada, Taylor & Arnold, Ltd., Montreal, Toronto, Winnipeg.**

OSBORN

# Moulding Machines

## Your Opportunity?

Everyone is on the lookout for ways and means of increasing production. Speed in machining your castings increases production. Is this problem bothering you? You know machining of castings but have you given sufficient attention to the way your castings were produced.

Do you know that Osborn Moulding Machines increase mould production thus decreasing the cost of each casting? And these castings made from machine made moulds:

1—Decrease your layout work
2—Assure quick and accurate jigging
3—Shorten the machine operation
4—Reduce the number of castings scrapped because they are more uniform, smoother and truer to pattern. In many cases reducing and eliminating machining.

Insist on castings made from machine made moulds—they shorten the machine operations.

*The better castings are produced from machine made moulds—are yours?*

THE CLEVELAND OSBORN MANUFACTURING CO.
INCORPORATED

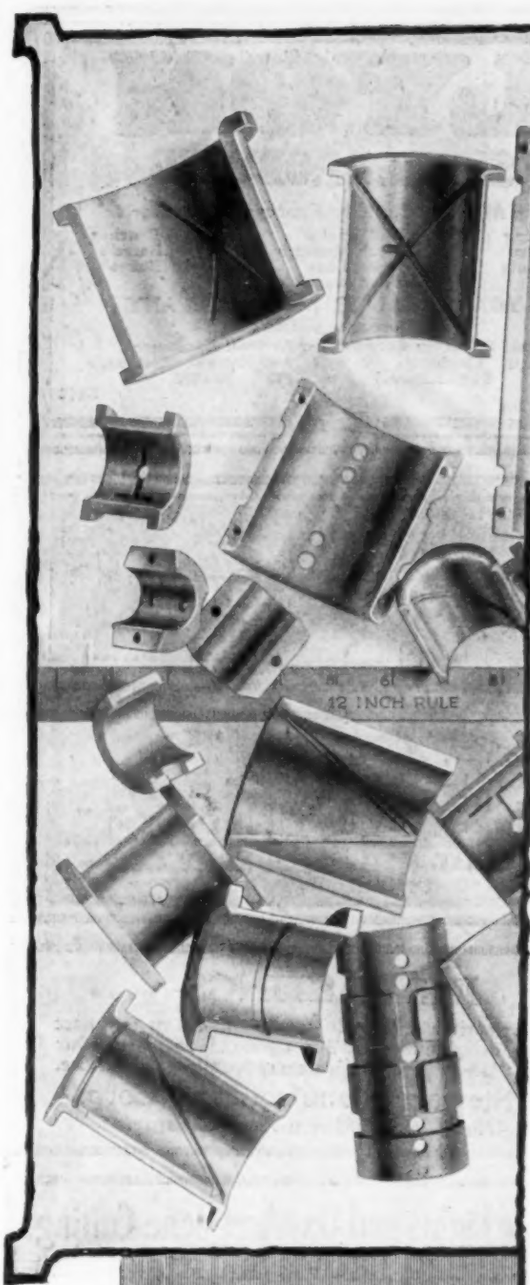
**5414 Hamilton Avenue, Cleveland, Ohio**

***Address Main Office or Branches, Dept. "N"***

**Chicago**
155 No. Clark St.

**New York**
3d Ave. at 35th St.
Bush Terminal Bldg. No. 5
Brooklyn

**San Francisco**
61 First St.




PRECISION CAST

# Every Die Casting You Buy Reflects Back to the Maker

Every die casting you buy reflects the experience of the organization that made it. Each requires a special die; *one* particular alloy; special knowledge and experience and a desire to serve the customer, to get the best results.

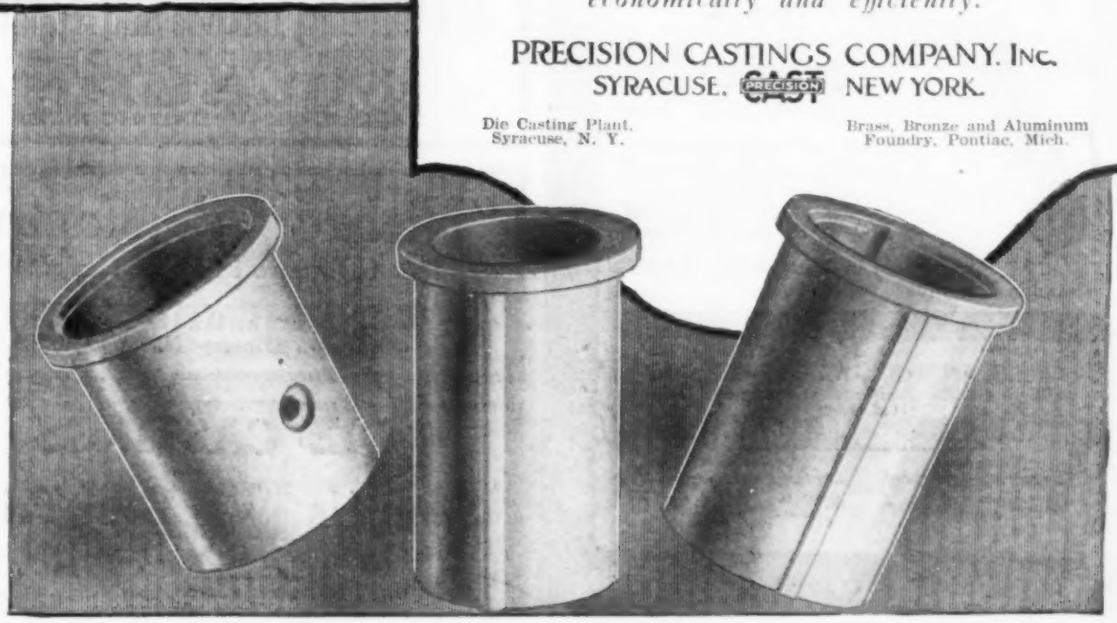
This Company has made millions of die castings. Orders have been completed for 25,000,000 or more pieces. We have made castings for almost every known trade or profession that uses die castings.

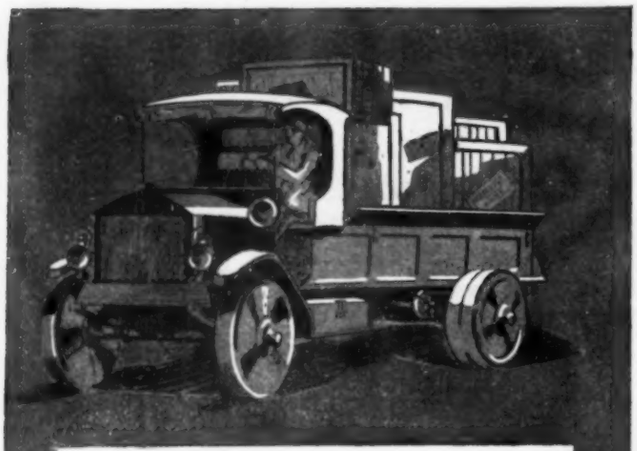
*Send blue prints or models, and let our engineering department show you how Precision Castings can serve economically and efficiently.*

PRECISION CASTINGS COMPANY, INC.
SYRACUSE, PRECISION CAST NEW YORK.

Die Casting Plant, Syracuse, N. Y.

Brass, Bronze and Aluminum Foundry, Pontiac, Mich.





# In the Truck

The fact that it is unaffected by oil or grease, makes *VUL-COT* Fibre a serviceable material for use as cylinder gaskets, crank case gaskets and smaller parts.

For facings of friction clutches and for brake banks *VUL-COT* Fibre meets every condition of reasonable use.

## *VUL-COT* Fibre

(A higher development of cotton vulcanized fibre)

Because of the ease with which it can be turned, tapped and threaded, and the smooth, even finish which it takes, it is well suited for the making of handles, cranks, etc.

Besides the parts named there are hundreds of others that are made or can be made of *VUL-COT* Fibre.

Truck and automobile manufacturers will be interested in our booklet on the electrical and mechanical uses of *VUL-COT* Fibre. Send for it.

*VUL-COT* Fibre is sold in sheets, rods and tubes, or machined to your specifications.

**AMERICAN VULCANIZED FIBRE CO.**
505 Equitable Building, Wilmington, Del.
*SALES OFFICES*
BOSTON NEW YORK PHILADELPHIA PITTSBURGH CLEVELAND DETROIT CHICAGO ST. LOUIS
*Complete Stock for Immediate Shipment at Chicago*
Western Agents: *Western Electric Company* — SAN FRANCISCO PORTLAND SEATTLE OAKLAND LOS ANGELES
Canadian Agents: *Northern Electric Company* LIMITED — MONTREAL TORONTO WINNIPEG OTTAWA HALIFAX CALGARY REGINA VANCOUVER

# LYON
## STEEL PRODUCTS
*The Mark of Quality Factory Equipment*

Shelving, Lockers, Cabinets — Tool Racks, Bench Drawers, Bench Legs — Benches, Barrels, Boxes

*Ask our nearest office.*

LYON METALLIC MFG. COMPANY
Aurora, Illinois
*Steel Shelving, Lockers and General Equipment.*
Chicago Cincinnati Detroit Pittsburgh Rochester Philadelphia New York Boston
5442

FRACTIONAL H.P. MOTORS.
BOSTON *Holtzer-Cabot* CHICAGO
FOR EVERY SERVICE

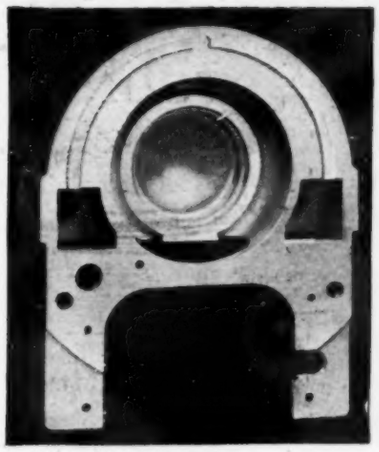
"Quality"
DIE CASTINGS
LMF CO
LIGHT MFG. & FOUNDRY CO.
Pottstown, Pa., U. S. A.

## DIE CASTINGS
Send blueprints or sample for quotations on any part made up in quantities of five thousand or more. Our new plant is equipped to give exceptionally good service.
The Stewart Manufacturing Corp.,
45th St. and Fullerton Ave., Chicago

## Carbide Lights and Oxy-Acetylene Cutting and Welding Torches and Apparatus
THE ALEXANDER MILBURN COMPANY-BALTIMORE, MD

## "Nichrome" Castings
"Made to Endure in High Temperature"
DRIVER-HARRIS COMPANY
CHICAGO HARRISON, N. J. MANCHESTER, ENGLAND

## DIE CASTINGS
Send Us MARF N.Y. Your Prints
MARF MACHINE CO., Inc.
17-27 Vandewater Street, New York City



DOEHLER
Aluminum Die-Cast
Magneto Frame

To produce successful die-castings, a perfectly developed organization, together with a highly specialized equipment, are absolutely essential.

**DOEHLER DIE-CASTINGS**

are produced by an organization whose sole and undivided efforts have, for years, been devoted to the manufacture of die-castings exclusively. Our equipment, the most perfect that modern ingenuity could devise, is of our own development, and the outgrowth of experience acquired by constant application and tireless research in this direction.

**DOEHLER DIE-CASTING CO.**

MAIN OFFICE AND EASTERN PLANT
BROOKLYN, N.Y.

WESTERN PLANT
TOLEDO, OHIO.

SALES OFFICES IN ALL PRINCIPAL CITIES

**CASTINGS**

**Any Size—From Ounces to 150,000 lbs. Each**

We'll make any kind of a casting from iron or semi-steel but our specialty is in making the large heavy castings of highest quality and great strength. Our years of experience in molding engine bases, cylinders, fly wheels, turbines, etc., assure you the best of service and castings that are right. **Write us about your requirements. Catalog upon request.**

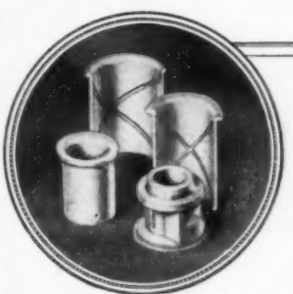
Foundry Department.

**Farrel Foundry & Machine Co.**
Ansonia Connecticut

**ACME-DIE**

**·CASTINGS·**

ALUMINUM-ZINC-TIN & LEAD ALLOYS
Acme Die-Casting Corp
Boston Rochester Brooklyn N.Y. Detroit Chicago



FRANKLIN
DIE-CASTINGS

**Bearings or Other Parts**

Some parts that you machine may be costing you too much, and the probability always exists that they may be replaced by Franklin Die-Castings, which cost less and lend themselves better to rapid quantity production.

Our 27 years' experience makes our judgment helpful as to the practical advisability of your using Die-Castings at any specified point, and we gladly co-operate with you on request.

*Booklet "H" which explains fully our die-castings and experience, is well worth writing for. Send sample of part, or blue print, and we will promptly make our recommendations.*

**FRANKLIN MFG. CO.**
740 GIFFORD ST., SYRACUSE, N. Y.

## The High Cost of Non-Standardization

"Special" furnaces are usually not so profitable as the buyer imagines.

In the first place, they lift the first cost by interrupting standard production.

Secondly, they aren't backed by the years of proven performance of the standard types.

And, thirdly, replacement parts are unduly expensive.

In five cases out of six where a special furnace is sought there's a standard S-C-H Furnace which will do the work with greater dependability and—in the long run—at lower cost.

After years of experience our most urgent and sincere advice is—STICK TO STANDARDIZATION FURNACES.

The S-C-H catalog describes the full line and makes it easy for you to make the proper selection.

# 75 answers to heat-treating problems

***No. 15***

*Ideal for oil temper drawing. Maintains a constant heat at any degree, turning out uniform work. Complete with hood, wire dip basket, chain hoist and thermometer.*

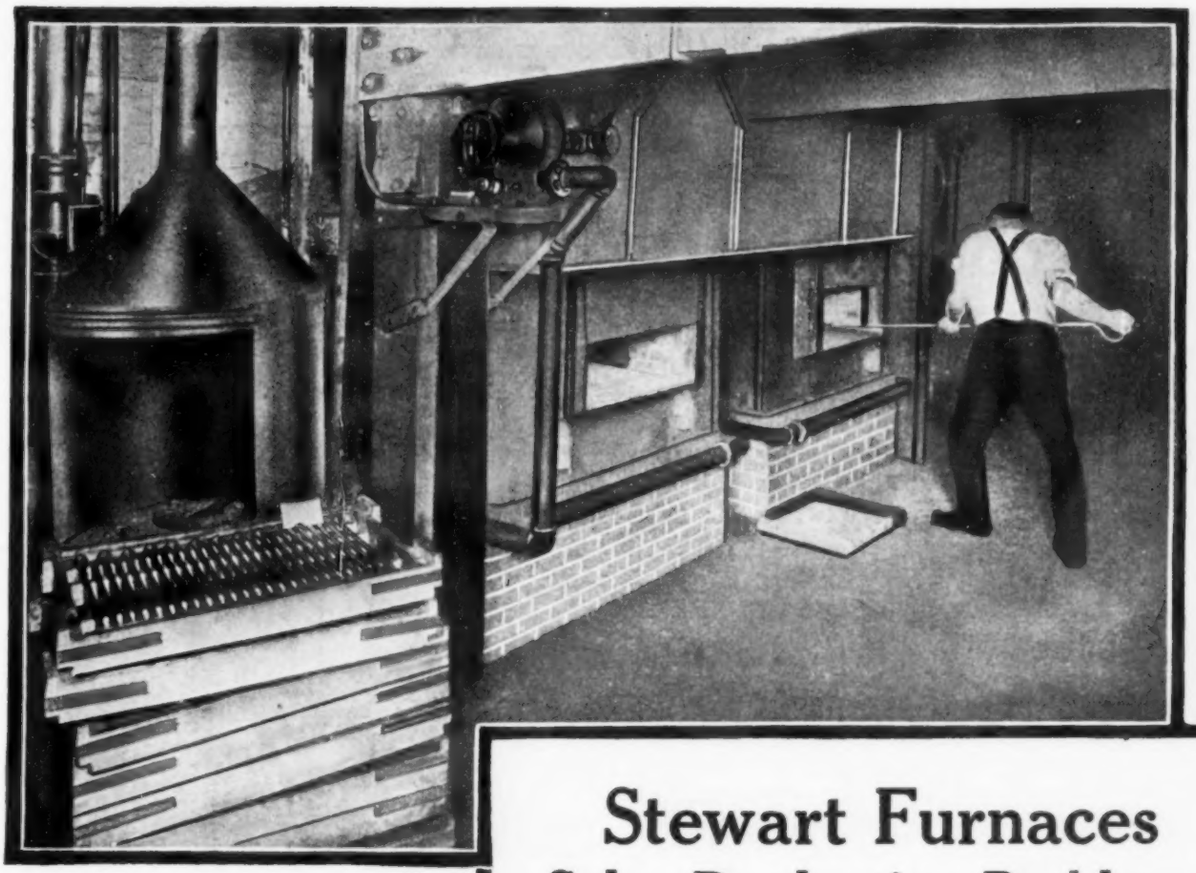
**Strong Carlisle & Hammond**

**INDUSTRIAL FURNACES for Oil, Natural Gas or Manufactured Gas**

IT'S a mighty rare heat-treating problem which can't be solved by a standard S-C-H Furnace. A complete line of 75 furnaces—one for every known heat-treating requirement—makes it easy to find the answer to your problems. And each furnace has a proven make-good record.

**The Strong, Carlisle & Hammond Co.**
**Cleveland, Ohio**

**BRANCHES:**
Boston
New York
Chicago
Philadelphia
Detroit
Pittsburgh



# Stewart Furnaces
## Solve Production Problems

STEWARTS are not built on theory alone, but are practically designed for thorough, dependable production day after day, under the most arduous heat treating requirements.

The illustration shows a section of the equipment of the Union Special Machinery Co. of Chicago. Here EIGHTEEN Stewart Furnaces are giving satisfactory production in case hardening and heat treating high grade tools and special machinery.

But they had to undergo a rigid test before being installed. This company lined up various makes of furnaces in a competitive test, and made them *prove* economy in operation and uniformity in results.

They found the Stewart Furnace used one-third less fuel than other makes, and gave greater and better results.

The Union Special Machinery Co. installed ALL Stewart Furnaces to meet the exacting needs of their busy plant. They are still on the job, and giving the highest type and quantity of production.

Ready to make a test of the Stewart in *your* plant? We study your production problems, recommend the equipment you need, and let you be the judge on a 30-day free trial offer. Could we make it fairer?

**Types covering every heat treating need shown in our catalog—send for it now**

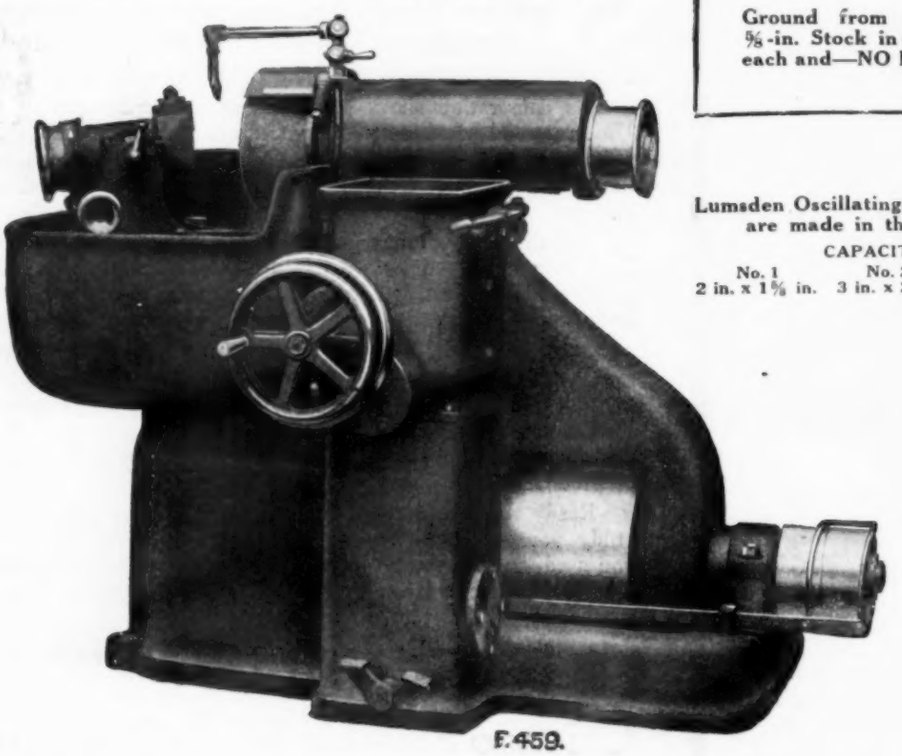
## Chicago Flexible Shaft Company

**1156 South Central Ave., Chicago**

# Lumsden Oscillating Tool Grinders

SEE one of these machines in actual operation at the American Foundrymen's Association Exhibition (Booths 241 and 243), at Philadelphia. Ask LeBlond, American Tool Works, or Lodge & Shipley, what they think of the Lumsden Grinders. They have them in use in their works and they know. We are also showing Turret Lathes which have unique features and will give you a new perspective on Turret Lathe production, etc.

**Alfred Herbert, Ltd.**
**54 Dey St., New York, N. Y.**



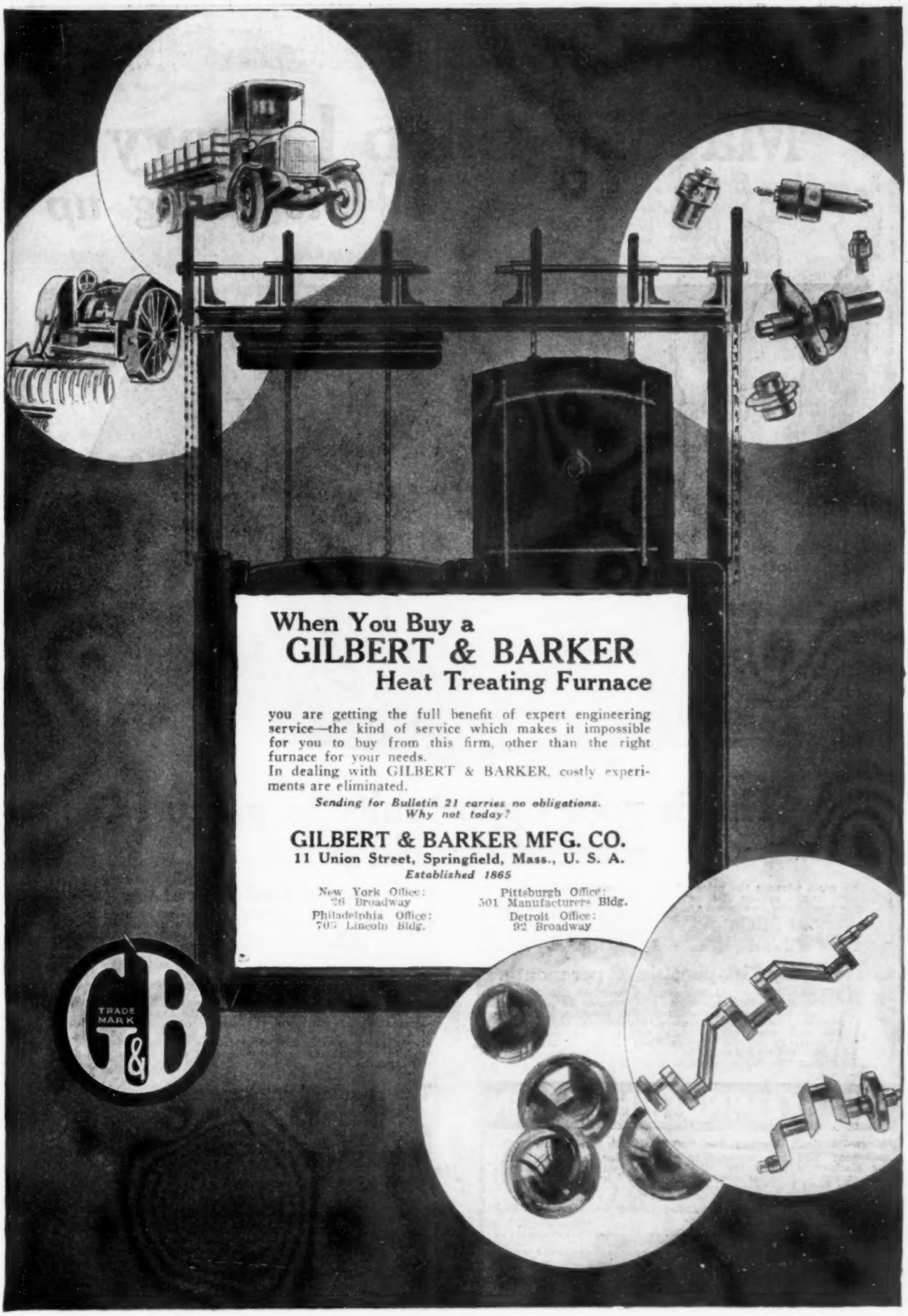
F.459.

**Ground from 1¼-in. x ⅝-in. Stock in 3 minutes each and—NO FORGING.**

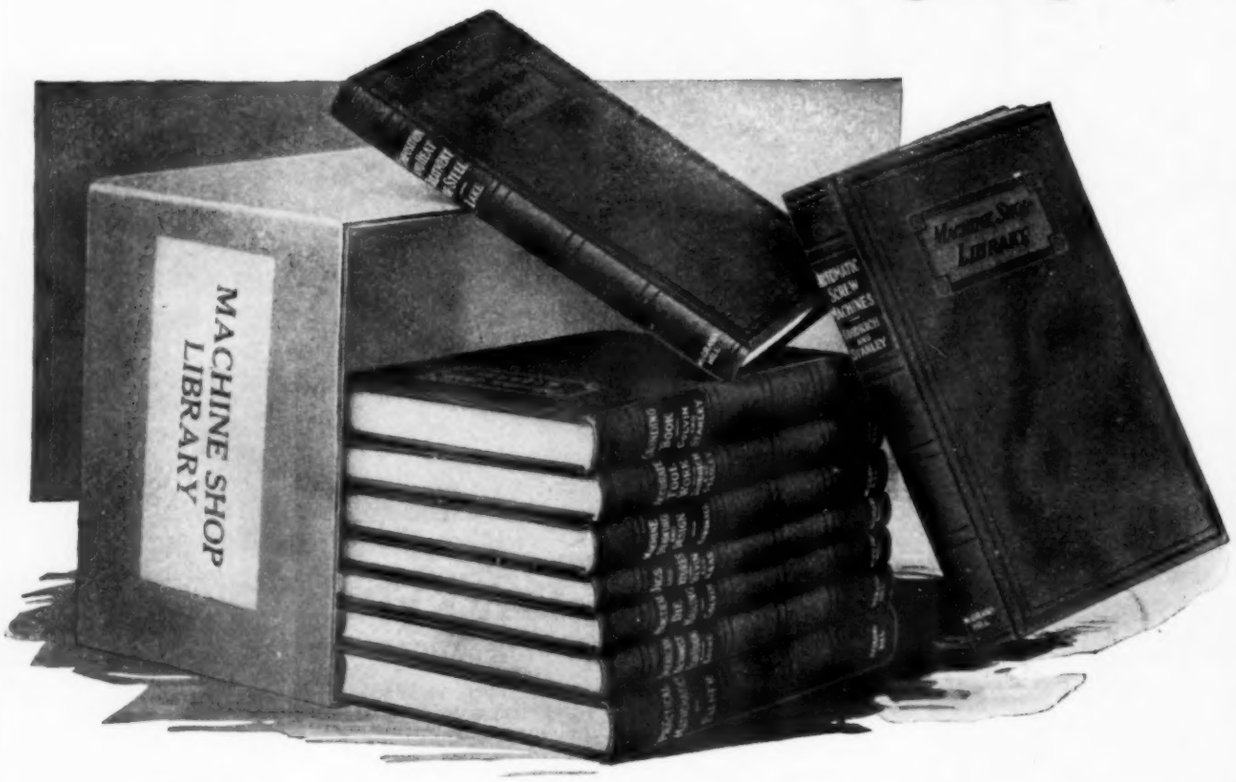
**Lumsden Oscillating Tool Grinders are made in three sizes:**

CAPACITY:

| No. 1 | No. 2 | No. 3 |
|---|---|---|
| 2 in. x 1⅝ in. | 3 in. x 2 in. | 6 in. x 3 in. |


When You Buy a
GILBERT & BARKER
Heat Treating Furnace
you are getting the full benefit of expert engineering service—the kind of service which makes it impossible for you to buy from this firm, other than the right furnace for your needs.
In dealing with GILBERT & BARKER, costly experiments are eliminated.
Sending for Bulletin 21 carries no obligations.
Why not today?
GILBERT & BARKER MFG. CO.
11 Union Street, Springfield, Mass., U. S. A.
Established 1865
New York Office: 26 Broadway
Pittsburgh Office: 501 Manufacturers Bldg.
Philadelphia Office: 705 Lincoln Bldg.
Detroit Office: 92 Broadway
TRADE MARK
G&B

# *The price of the*
# Machine Shop Library
## *is going up*




## This is your opportunity to procure a set at the old price

We must advance the price of the Machine Shop Library. We have fought against this increase as long as we could. For more than two years the price of materials and workmanship have been steadily going up. On many items these increases have exceeded 100%, yet we have maintained the old selling price, hoping for a decline in costs with the ending of the war. Instead of a decline, we are now paying further big advances.

### Now only $16, payable $2 per month.

It will soon be too late to procure a complete technical education in machine shop practice at $16, payable $2 per month. Thousands of managers, superintendents, foremen, gaugemakers, toolmakers, machinists, operators, apprentices, and others connected with the machine shop, will take advantage of this opportunity to get the Machine Shop Library at the old price. No better investment could be made, even at the increased price. Thousands will buy at the old figure and save money.

### Save years of hard work at low pay.

In the Machine Shop Library you receive in nine compact volumes what eight men have learned in a lifetime of practice. Every subject in the 3,000 pages is at the finger's end. Every subject is explained in the practical man's language. Nothing is beyond his understanding

### Merely return the coupon.

Just fill out the coupon below and return to us. We will send the nine volumes charges prepaid for ten days' absolutely free examination. If they are not satisfactory return them, again at our expense.
If you decide you cannot afford to be without the most used machine shop library in existence, send only $2 per month for eight months.

### The standard in America.

The eight authors of the Machine Shop Library are among the leading authorities on machine shop practice in this country. No other set of books or courses ever adhered so closely to actual practice. No other sets of books or courses were ever written in such clear, understandable language, and illustrated with drawings of such educational value.

## FREE EXAMINATION COUPON

**McGraw-Hill Book Company, Inc., 239 West 39th Street, New York.**

Gentlemen: You are requested to send me for free examination your Machine Shop Library, nine volumes, you to pay transportation charges. If satisfactory I will send $2 in ten days and $2 per month until I have paid your special price on the books, $16. If they are not what I want I will write you for shipping instructions, and I am to be put to no expense. **(Price $20 after Nov. 20.)**

Name .....
Home Address .....
City and State.....
Company or Employer.....
Occupation ..... A 9-25-19

McGraw-Hill Book Co., Inc.
239 West 39th Street, New York
*Publishers of Books for American Machinist*

## *Engrave Your Own*

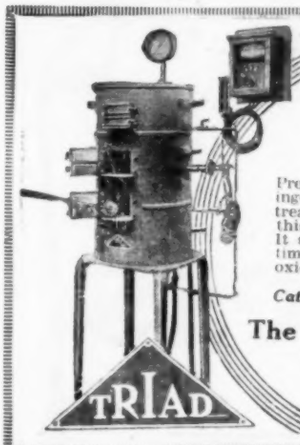
Here is an engraving machine that has been designed especially for shops that would do engraving at home if it was found to be more economical. This machine is of the routing type having a rapidly revolving cutter driven by an electric motor.

It is designed to accurately and speedily engrave steel, brass and other metals.

The money this machine will save you on your engraving will soon more than pay for it.

***Complete details upon request.***

**Engravers & Printers Mach. Co.**
Sag Harbor, New York

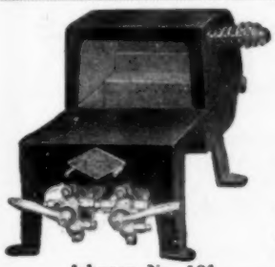



## The 3 Purpose Furnace

Preheating, Hardening, Tempering—you can perform all three treatments with one burner with this economy furnace—the Triad. It saves fuel, floor space, labor, time and avoids the danger of oxidizing tools under treatment.

***Catalog 10 gives full particulars***

**The W. R. Bennett Co.**
1045 New Britain Ave.
Elmwood, Conn.



**Johnson No. 101**

## 1800°

### Fahrenheit

### Without a Blower

The Johnson Atmospheric Bunsen does the trick. This furnace will heat-treat taps, dies, reamers or cutters. Will also handle soldering coppers up to 10 lb. a pair. Just the thing for your tool room of tin shop.

***Write us today for particulars***

**Johnson Gas Appliance Co.**
Cedar Rapids, Iowa

# Smallwood
## FURNACES

### For

### Accurate Control
### Greater Economy

The unusual construction of Smallwood Heat Treating Furnaces guarantees uniform treatment as a real commercial proposition.

Actual control of the heat insures the same dependable quality in all heat treated parts and longer life in the assembled product.

The added advantage of Smallwood Furnaces is the larger amount of better work turned out in a given time. The work is heated more quickly from all directions. This is also one of the reasons for the remarkably low fuel consumption.

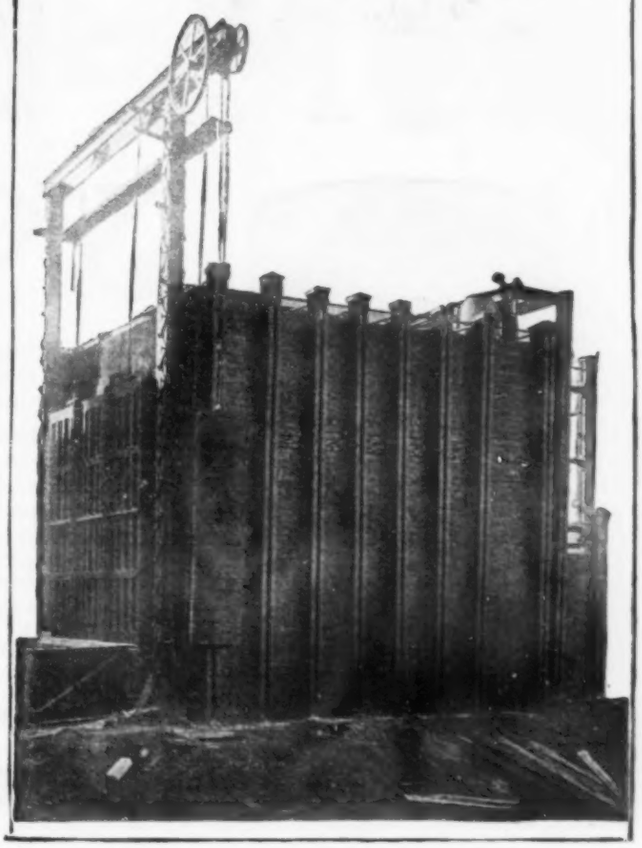
BITUMINOUS COAL, OIL OR GAS MAY BE USED AS FUEL AND ALL ARE BURNED AT VERY HIGH COMBUSTION EFFICIENCY.

*Our engineers can show you some real heat treating economies and apply them to your plant conditions. Write today.*

**THE AMERICAN INCANDESCENT HEAT COMPANY, Inc.**

***Furnace Builders under the Smallwood Patents***

**10 Post Office Sq., Boston**



# A Size to Suit

and
every
size
will suit

HART ROLLER BEARING CO.
25 MAIN STREET, ORANGE, N. J.

HART
STAGGERED ROLLER
BEARINGS

*Send for Details*

# it's Metal yet oilless

A young engineer has discovered a method for making a Metal Oilless Bearing which will answer satisfactorily every bearing need.

This discovery revolutionizes the use of bearings. No more oil to buy, no more labor expended in applying oil and no more greasy accumulations always present where oil is used.

These bearings are made by mixing specially treated graphite with the bearing alloy making the bearing a lubricant capable of carrying a load with speed and with minimum wear.

These bearings are made for all purposes. They are absolutely guaranteed.

A New Booklet, just off the press, tells all about this wonderful product. A copy will gladly be sent to all who ask for it.

**Massachusetts Oilless Bearings Co., Worcester, Mass.**

# MACHINEBRONZE

## FOR AUTOMOBILE AND MACHINERY CONSTRUCTION AND REPAIR

SOLID and Cored Bars in 12″ lengths from ½″ to 4½″ O. D. inclusive, by eighths. Don't wait the convenience of a foundry when you need a Bearing. Get Machinebronze from stock.

Your machines need not waste good time when a Bearing goes bad.

*Machinebronze is always in stock for your convenience at the following distributors:*

| | |
|---|---|
| The T. B. Rayl Company | DETROIT, MICH. |
| Chandler & Farquhar Company | BOSTON, MASS. |
| Sherritt & Stoer Co., Inc. | PHILADELPHIA, PA. |
| Richards & Conover | KANSAS CITY, MO. / OKLAHOMA CITY |
| Smith-Courtney Company | RICHMOND, VA. |
| Beals, McCarthy & Rogers | BUFFALO, N. Y. |
| Manning, Maxwell & Moore, Inc. | NEW YORK CITY |
| Badger-Packard Machinery Company, | MILWAUKEE, WIS. |
| E. A. Kinsey Company | CINCINNATI, O. |
| Machinists Supply Company | CHICAGO, ILL. |
| Beck & Gregg Hardware Company | ATLANTA, GA. |
| McMullen Machinery Company, | GRAND RAPIDS, MICH. |
| Brown & Zortman Machinery Company, | PITTSBURGH, PA. |
| Cleveland Tool and Supply Company, | CLEVELAND, O. |
| J. Russell Company | HOLYOKE, MASS. |
| Vermont Farm Machinery Co. | BELLOWS FALLS, VT. |
| Frank Wheeler & Son | MERIDEN, CONN. |

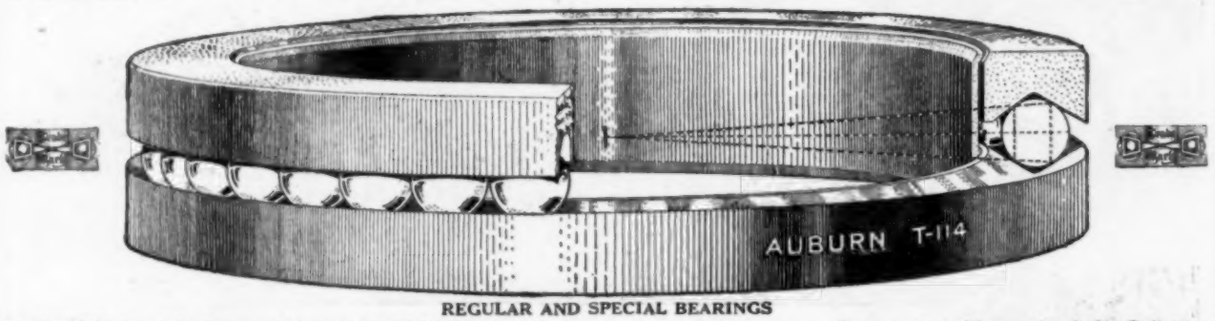
***Machinebronze is guaranteed free from melting and molding defects.***

# LUMEN BEARING COMPANY

## BRASS FOUNDERS

## BUFFALO

# AUBURN BALL THRUST BEARINGS



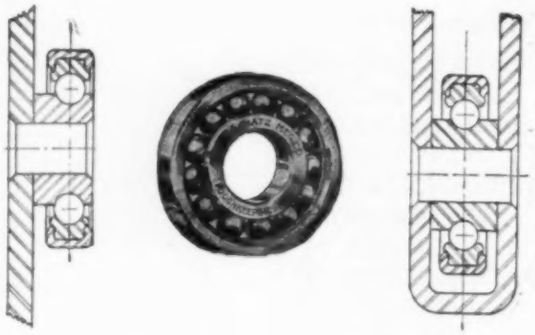

REGULAR AND SPECIAL BEARINGS

**AUBURN BALL BEARING COMPANY,** 25 Elizabeth St., Rochester, N. Y.

State your problem and ask for Bulletins.
Steel, Brass and Bronze Balls.

THE "Commercial" ANNULAR BALL BEARING

Made for shafts from ⅞ in. to 1⅞ in. diameter. Outside diameters from 1⅛ in. to 2⅝ in. For speeds up to 3000 r.p.m. While millions are used annually on rotating shafts, other millions are used as rollers.

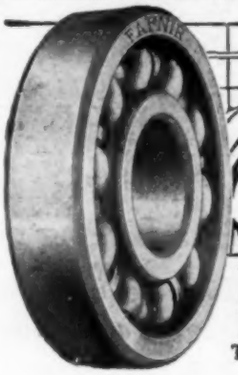


Our new catalog will suggest uses for "Commercial" Bearings that will advantage you. Send for a copy.

**The Schatz Manufacturing Co.**

Poughkeepsie, N. Y.

Great Britain: 37 Sheen Road, Richmond, London



# FAFNIR BALL BEARINGS

THE FAFNIR BEARING COMPANY

Gamed Patent Licensee

New Britain, Conn.

# PRECISION BEARINGS

BALL ROLLER THRUST COMBINATION

NORMA

THE NORMA COMPANY OF AMERICA

1790 BROADWAY NEW YORK

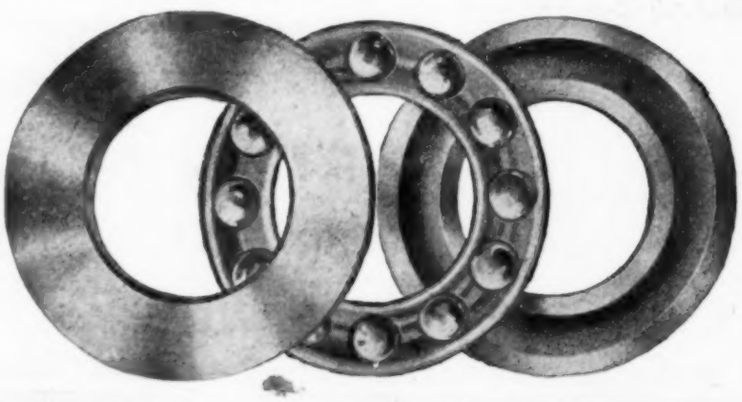
**Ball Thrust Bearings of all types used in Airplane construction**

**Thrust Bearings built to your requirements**

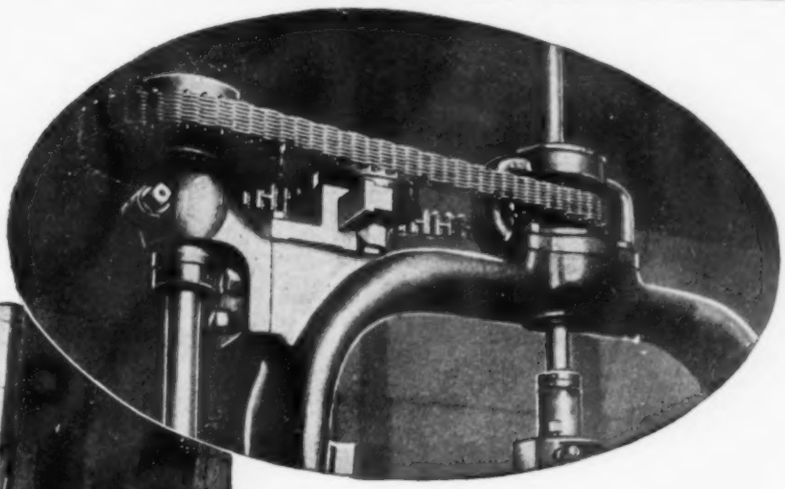
**The Bearings Company of America**

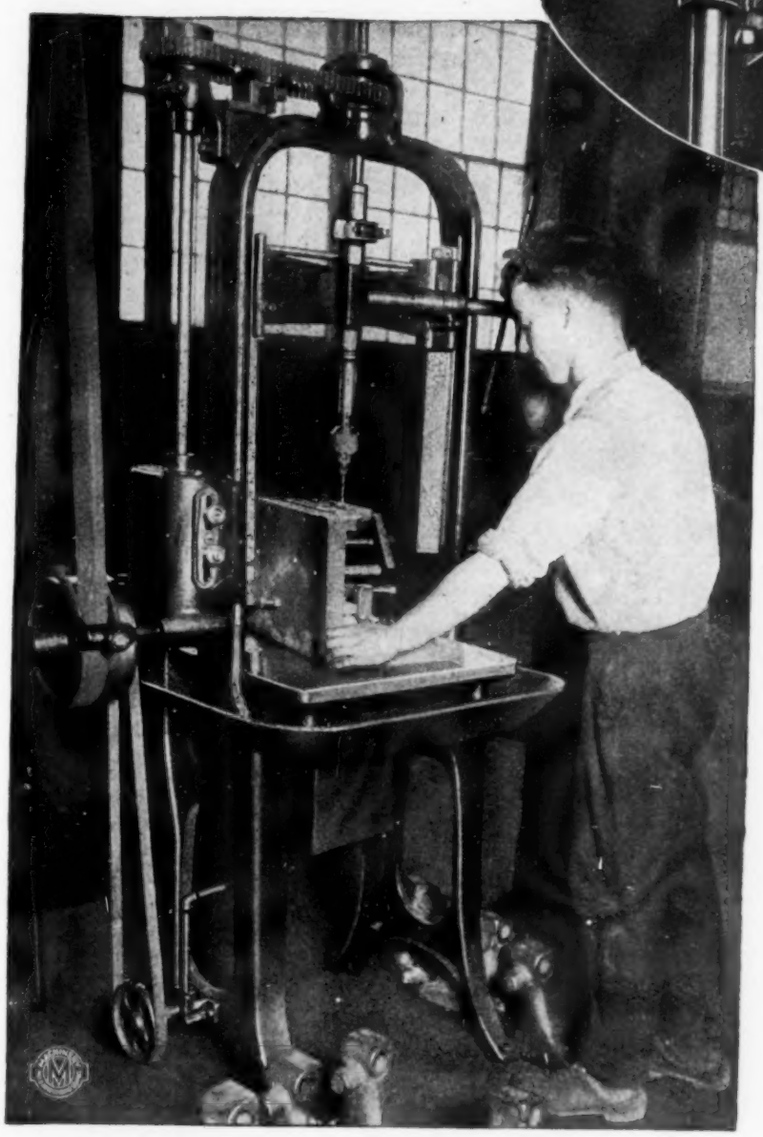
**Lancaster, Penna.**

Western Sales Offices
1012 Ford Building, Detroit, Mich.



# The Drive for High Speed or Heavy Service





**Gearing in this capacity would be noisy and would depreciate rapidly. Belting would necessitate a large idler and the power loss would be prohibitive. Chain is the answer to a problem of this kind—Morse Chain.**

## There Are Reasons Why This New Drilling Machine Is Driven by Morse Silent Chain

This new drill is a product of the Edlund Machinery Co., of Cortland, N. Y., and is designed for heavy duty drilling at high speeds.

As may be seen, a vertical drive shaft parallel to the drill spindle extends upward from the feed change box to the top of the machine.

From this point a 1-in. Morse Silent Chain transmits power to the vertical shaft which drives the drill spindle. The sprocket on the drive shaft has 37 teeth, that on the drill spindle 25.

With the drive pulley running at 500 R.P.M., four spindle speeds are obtained —380, 660, 950 and 1215 R.P.M.

**MORSE CHAIN CO.,** LARGEST MANUFACTURERS OF SILENT CHAINS IN THE WORLD **ITHACA, N. Y.**

*Morse Engineering Service* *Write for Booklets* *Assistance Without Obligation*

*Address Nearest Office*

BOSTON, MASS.....141 Milk Street
CHICAGO, ILL.....Merchants L. & T. Bldg.
CLEVELAND, OHIO.....Engineers Bldg.
DETROIT, MICH.....1003 Woodward Ave.
GREENSBORO, N. C.....805 Ashboro Street
NEW YORK CITY.....50 Church St.
PITTSBURGH, PA.....Westinghouse Bldg.
SAN FRANCISCO, CALIF.....Monadnock Bldg.
ATLANTA, GA., Candler Bldg.....Earl F. Scott, M. E.
CANADA.....Jones & Glasco, Regis'd.
MONTREAL, St. Nicholas Bldg.....Toronto, Traders' Bank Bldg.
KANSAS CITY, MO., Long Bldg.....Morse Engineering Co.
MINNEAPOLIS, MINN., 413 3rd St. S.....Strong-Scott Mfg. Co.
ST. LOUIS, MO., Chemical Bldg.....Morse Engineering Co.

**"Morse Is the Guarantee Always Behind the Efficiency, Durability and Service"**

*Contains complete information regarding Friction Clutches for all kinds of work.*

WEIGHTS, BORES, DIMENSIONS, SPEEDS, HORSEPOWERS, ETC.

*Sent free upon request.*
**Ask for Catalog "E"**

# Figure Your Friction Clutch Installations *with* This Book

We make Standard Clutches for low speeds and moderate horsepower. High Speed Clutches for high speed and great horsepower.
If you have any use at all for Friction Clutches, you cannot afford to be without our Catalog.

"M. & W." Friction Clutches Eliminate Transmission Troubles.

MADE ONLY BY

The Moore & White Co., 2701-2731 *North 15th St.*, Philadelphia, Pa., U. S. A.

*Sold by leading dealers in Mine, Mill and Factory Supplies*

# Made By Machine Tool Builders of 50 Years' Experience

**Send for Bulletin**

# PEERLESS HOISTS

EDWIN HARRINGTON, SON & CO., INC.
PHILADELPHIA, PA.

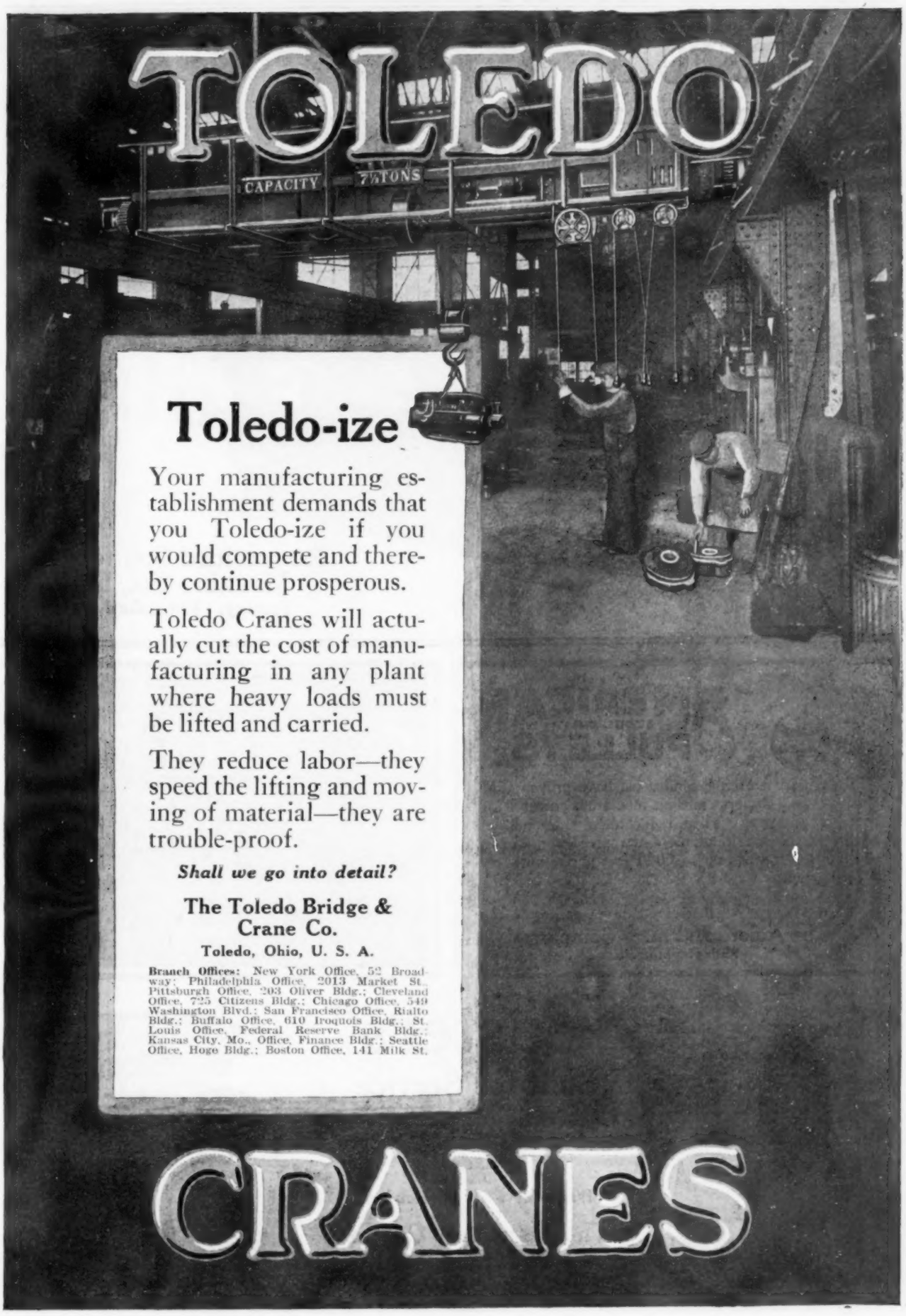
# FORD TRIBLOC

THE eighty-two pound pull of one man will lift a ton, for eighty per cent. of the power applied to the hand chain of a Tribloc is converted into lifting energy—this high efficiency which lasts throughout the life of the hoist is due to the planetary gear operating mechanism with steel gears. Chains, hooks and all working parts also are made of steel—a durable, dependable hoist construction.

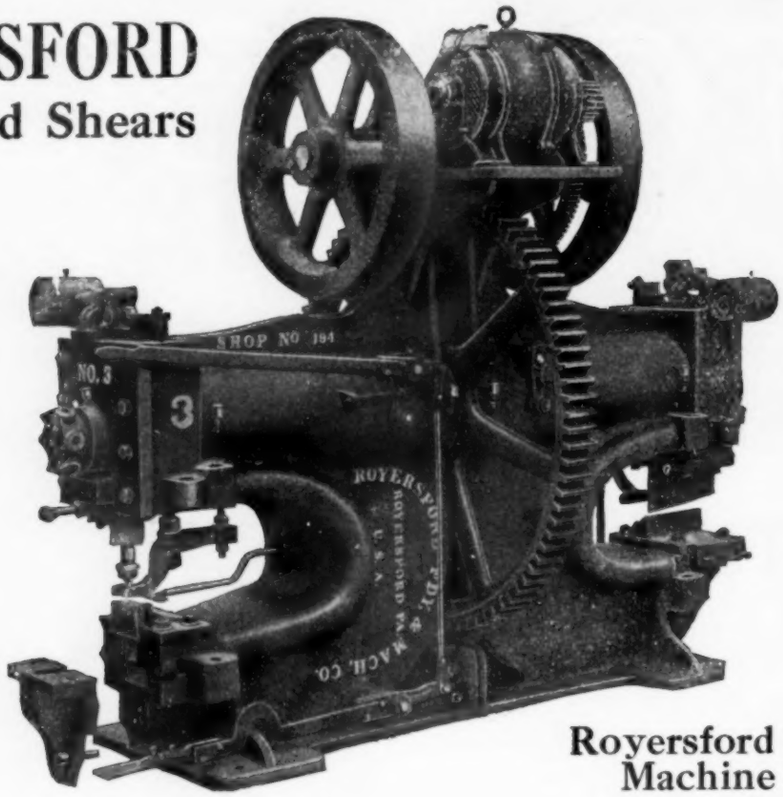
The Loop Hand Chain Guide, a distinctive patented feature, makes a Tribloc safe in all operations, saves the working parts from damage when working at high speed, prevents "gagging" of the hand chain and its overriding the flange of the hand wheel.

**There's a 5-year guarantee with every Tribloc—in capacities of 1-2 to 40 tons.**

**Ford Chain Block & Mfg. Company**
Second and Diamond Sts.
Philadelphia, Pa
2155-D


TOLEDO
CAPACITY 7½ TONS
Toledo-ize
Your manufacturing establishment demands that you Toledo-ize if you would compete and thereby continue prosperous.
Toledo Cranes will actually cut the cost of manufacturing in any plant where heavy loads must be lifted and carried.
They reduce labor—they speed the lifting and moving of material—they are trouble-proof.
*Shall we go into detail?*
The Toledo Bridge & Crane Co.
Toledo, Ohio, U. S. A.
Branch Offices: New York Office, 52 Broadway; Philadelphia Office, 2013 Market St.; Pittsburgh Office, 203 Oliver Bldg.; Cleveland Office, 725 Citizens Bldg.; Chicago Office, 549 Washington Blvd.; San Francisco Office, Rialto Bldg.; Buffalo Office, 610 Iroquois Bldg.; St. Louis Office, Federal Reserve Bank Bldg.; Kansas City, Mo., Office, Finance Bldg.; Seattle Office, Hoge Bldg.; Boston Office, 141 Milk St.
CRANES

# ROYERSFORD
## Punch and Shears




Write for Catalog

Motor or Belt Drive

**Royersford Foundry & Machine Co., Inc.**
Factory: Royersford, Pa.

---

# AMERICAN STEEL SPLIT PULLEYS

Tests, under working conditions, have proven that "American" Pulleys transmit maximum power with minimum waste. They reduce belt slip and air resistance to a minimum. Guaranteed for double belt duty. Speeds up to 6000 feet per minute are recommended.

Write for 37-page book "Getting Maximum Pulley Efficiency."

**The American Pulley Company**
Philadelphia, Pa.

---

*"The Most Rugged Crane Built"*

# CHESAPEAKE CRANES

**Any Capacity-Prompt Shipments**

**Chesapeake Iron Works**
Baltimore, Md.

---

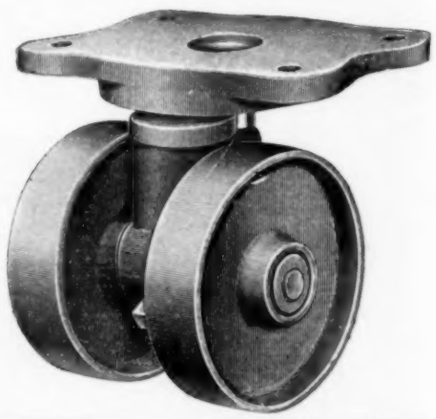
# "Casters"

## Built for Service

**Easiest Running, Strongest and Most Durable Casters Made**

*Write for Full Particulars*

**The Hamilton Caster & Mfg. Co.**
Hamilton, O.



# Latrobe

## HIGH SPEED DRILLS

## Inspection assures Perfection

DUE to extreme care used in their manufacture, **Latrobe** Drills and Reamers would still lead all others, even though they were not inspected; nevertheless, the **Latrobe** Ideal is so high that the element of chance is entirely eliminated, and every Drill and Reamer of this make is rigorously inspected, not once, but many times, and by different inspectors, to make sure that it measures up to the **Latrobe** standard of 100% accuracy. Yet Inspection is only one of the factors which make **Latrobe** Drills superior.

**Latrobe** Drills have all the strength of the forged Drill plus the accuracy of the milled Drill.

LOOK FOR THE NAME **Latrobe** ON THE SHANK

## LATROBE TOOL CO.

MANUFACTURERS

## LATROBE, PENNA.

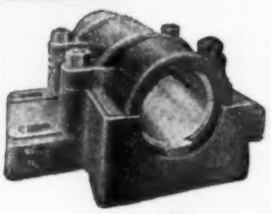
The hot rolling of this special high speed steel section compresses the steel in the center, therefore when the drill is twisted the toughest portion is in the exact center.

FOUR FLUTE SPIRAL REAMER

## The Road to Transmission Efficiency

**The Bond Line of Transmission Specialties** is designed to reduce friction and the corresponding loss of power to a minimum. Bond Pillow Blocks, Post, Bracket and Drop Hangers all have for the basis of their design fundamental principles of science. Try them and note the increase in per cent. efficiency of your transmission system.

Write now for our Catalog 38AM. It will give you some new ideas in transmission specialties.



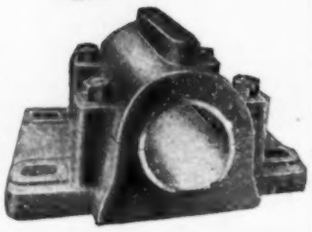
**Bond Foundry & Machine Co.**

*Sole Manufacturers:*

**Manheim, Lancaster Co. Pa., U. S. A.**

ASSOCIATED COMPANIES:

Charles Bond Company, Philadelphia, Pa.; J. & G. Rich Company, Philadelphia, Pa.; Christiania Machine Company, Christiania, Pa.; Bond Engineering Works, Ltd., Toronto, Canada.



**Gray & Prior**

**Universal Joints**

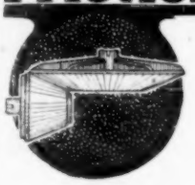
**For Efficient Power Transmission**

*Write for circular of details*

**The Gray & Prior Machine Co.**

**69 Suffield Street, Hartford, Conn., U. S. A.**

# ROCKWOOD Friction Transmission

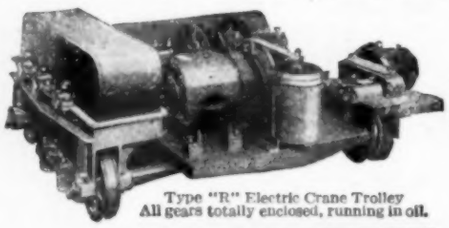


**Four Vital Points**

Rockwood Friction Transmission gives:
Absolute quiet operation.
Ability to start quickly, accelerate with great speed, and to stop suddenly.
First cost is less than toothed gears.
Repairs are cheaper and needed less frequently.
Investigate it for your product and plant.

**The Rockwood Mfg. Co.** 1910 English Avenue, Indianapolis, Ind.

# WHITING CRANES



Type "B" Electric Crane Trolley
All gears totally enclosed, running in oil.

Send for Catalog 130

Foundries Equipped Complete

**WHITING FOUNDRY EQUIPMENT CO.**
HARVEY-ILL. U. S. A.
CHICAGO SUBURB

Cranes of all Types

**Northern Cranes**

and Electric Hoists for Standard or Grab Bucket service—learn more about them.

*Bulletin free.*

**NORTHERN ENGINEERING WORKS**
DETROIT, MICH. U. S. A.

# P&H cranes-hoists-monorail systems

**PAWLING & HARNISCHFEGER CO.**
MILWAUKEE WISCONSIN

## The Jackson Belt Lacing Machine

saves its cost every few months. It's light and portable and produces a joint in three minutes that will stand a tensile strength of 1900 lbs. With it one man can do in three minutes at a cost for material of one cent. what usually requires a half hour of two men's time and 10 to 12 cents worth of rawhide the old way. **Write for the "Jackson Book."**

Birdsboro Steel Foundry & Machine Co., Birdsboro, Penn.

SHAFTING FRICTION
GEARS CLUTCH
HANGERS PULLEYS

ENGINEERS FOUNDERS MACHINISTS MILLWRIGHTS
ESTABLISHED 1854
**THE A. & F. BROWN CO.**
79 BARCLAY ST. NEW YORK

# SMOOTH-ON FOR LEAKS

**Write for this Free Booklet.**

Learn the sure, permanent way to stop leaks of steam, water, oil, gas or air in pipes, boilers, tanks, etc., with

**SMOOTH-ON Iron Cements**

**SMOOTH-ON Mfg. Co., Jersey City, N. J., U. S. A.**

# Save 80%

**in your handling cost by using STUEBING Lift Trucks and Platforms.**

One man with a Stuebing and Platforms will do the same work formerly requiring five men with ordinary four-wheeled trucks.

**THE STUEBING TRUCK CO.**
FORDICK BLDG. CINCINNATI, OHIO

# EUCLID ELECTRIC

**HOISTS**
**MONORAIL TROLLEYS**
**TRAVELING CRANES**
**WALL and JIB CRANES**

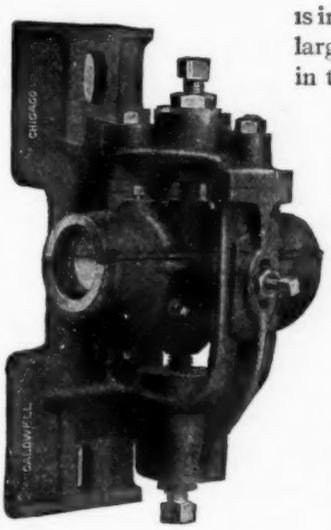
One piece frame, accurately jigged, insures perfect alignment of shafts and rigidity of bearings. Any standard motor can be used.

Suspension yokes and trolleys are interchangeable. All gears fully enclosed in dirt and weatherproof housing. All gears and load brake run in oil. Fewer parts. Heavier and more rugged in design. Perfect accessibility of all parts. Each hoist fully guaranteed.

***Write now for catalog of Complete Line.***

**Euclid Crane & Hoist Co., Euclid, Ohio, U. S. A.**

# CALDWELL
## Power Transmitting Machinery



is in use in some of the largest machine shops in the country.

We carry a complete line of pulleys, shafts, clutches, etc.

And we are prepared to make special equipment to order.

In selecting Caldwell machinery you secure equipment built to a standard that assures its long life.

**H. W. Caldwell & Son Co.**

| New York | Chicago | Dallas |
|---|---|---|
| 50 Church St. | 17th and Western Ave. | 711 Main St. |

# 3 Important reasons for Schatz "UNIVERSAL" Annular Ball Bearing SUPERIORITY

There are *three* real reasons for the superior performance of this bearing.

**FIRST:**—There is no sliding friction.
**SECOND:**—Shock through ball center is impossible.
**THIRD:**—Greater carrying capacity and thorough lubrication always.

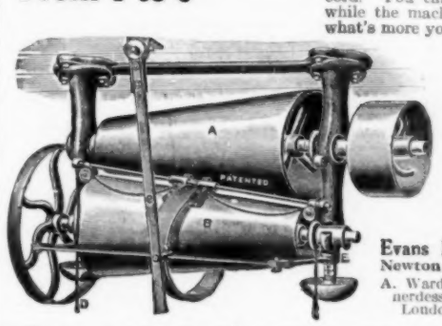
For all industrial purposes, SCHATZ UNIVERSAL Design plus SCHATZ UNIVERSAL Quality assures the user of absolute satisfaction.

**The Federal Bearings Co., Inc.**
**Poughkeepsie, N. Y.**
Great Britain: 37 Sheen Road, Richmond, London.

## Drives Machine At Any Desired Speed From 1 to 6

There's no simpler way of obtaining variable speed than by using the Evans Variable Speed Countershaft. And no *surer* way. All you have to do to change the speed is pull the cord. You can change the speed while the machine is running and what's more you can stop *and start* again at any desired speed. We guarantee the service that this device will give. The fact that over 10,000 sets are in use is in itself a guarantee of satisfaction. Made for floor or hanging use.

*Catalog 25P*



**Evans Friction Cone Co.**
**Newton Highlands, Mass.**
A. Warden & Co., 48 Shepherdess Walk, City Road, London, E. C., England

Trade READING Mark
PRODUCTS

This Trade Mark stands for
**QUALITY**
**For 20 years**

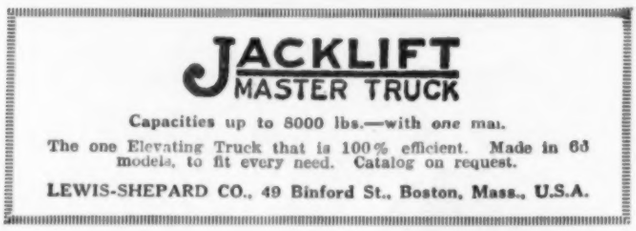
**Reading Multiple Gear Chain Blocks**
***have stood the test for***
***Strength, Efficiency, Durability***

**Reading Chain and Block Corp.**
**Reading, Pa., U. S. A.**
*Export Dept.:*
17 Battery Place, New York, [illegible]

TILTON
The Very different High Speed Belt
No slip, no slap, no jump, no stretch
As Endless as a Circle
Send for Catalog
Arthur S. Brown Manufacturing Co
TILTON N.H.
ENDLESS
TILTON
WOVEN BELTS

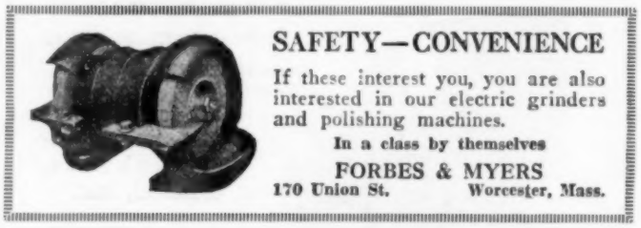
"Baldwin—Its the Chain That Stands the Strain"
GENUINE
BALDWIN
CHAINS
AND SPROCKETS
There's a genuine Baldwin Chain Drive for every industrial purpose.
BALDWIN CHAIN & MFG. CO., Worcester, Mass.

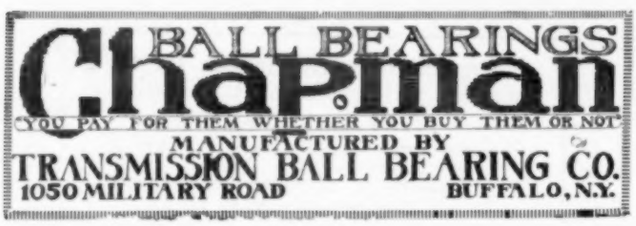
CLUTCHES for all purposes
Quick shipments from large finished stock.
Hilliard Clutch & Mchy. Co.
Elmira, N. Y.

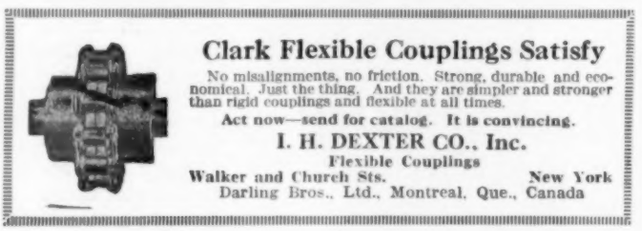

JACKLIFT
MASTER TRUCK
Capacities up to 8000 lbs.—with one man.
The one Elevating Truck that is 100% efficient. Made in 60 models, to fit every need. Catalog on request.
LEWIS-SHEPARD CO., 49 Binford St., Boston, Mass., U.S.A.

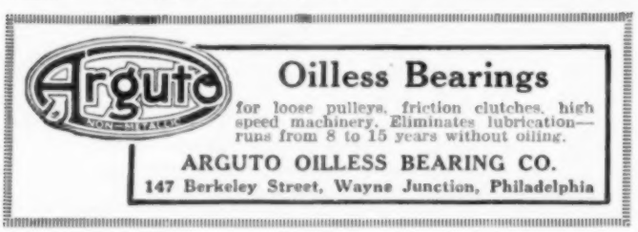
CYCLONE HOISTS
One-quarter to forty-ton sizes. Jobbers in all cities.
Catalog No. 61 on request.
The Chisholm-Moore Mfg. Co., Cleveland, Ohio.
HIGH SPEED

STEEL BALLS
If that is what you want we can furnish you. All we ask is an opportunity to quote on your requirements—any grade—and after one trial you will specify nothing but "Abbott" make.
Kindly give us an opportunity to quote you our attractive prices.
Abbott Ball Co., P. O. Box 1233 Hartford, Conn.


SAFETY—CONVENIENCE
If these interest you, you are also interested in our electric grinders and polishing machines.
In a class by themselves
FORBES & MYERS
170 Union St. Worcester, Mass.


BALL BEARINGS
Chapman
YOU PAY FOR THEM WHETHER YOU BUY THEM OR NOT
MANUFACTURED BY
TRANSMISSION BALL BEARING CO.
1050 MILITARY ROAD BUFFALO, N.Y.

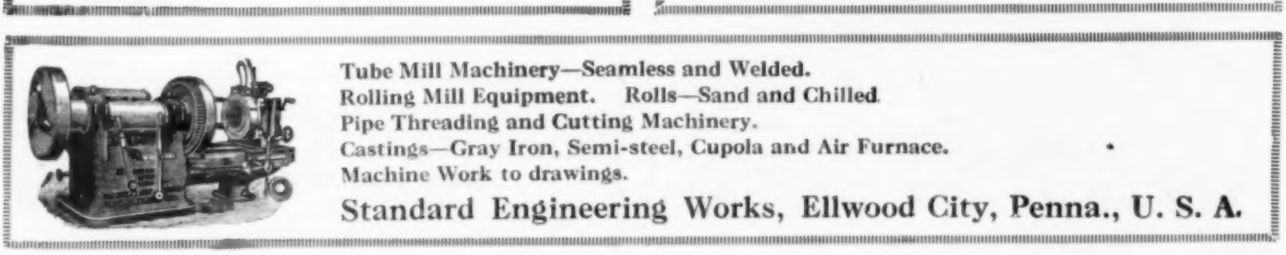

Clark Flexible Couplings Satisfy
No misalignments, no friction. Strong, durable and economical. Just the thing. And they are simpler and stronger than rigid couplings and flexible at all times.
Act now—send for catalog. It is convincing.
I. H. DEXTER CO., Inc.
Flexible Couplings
Walker and Church Sts. New York
Darling Bros., Ltd., Montreal, Que., Canada

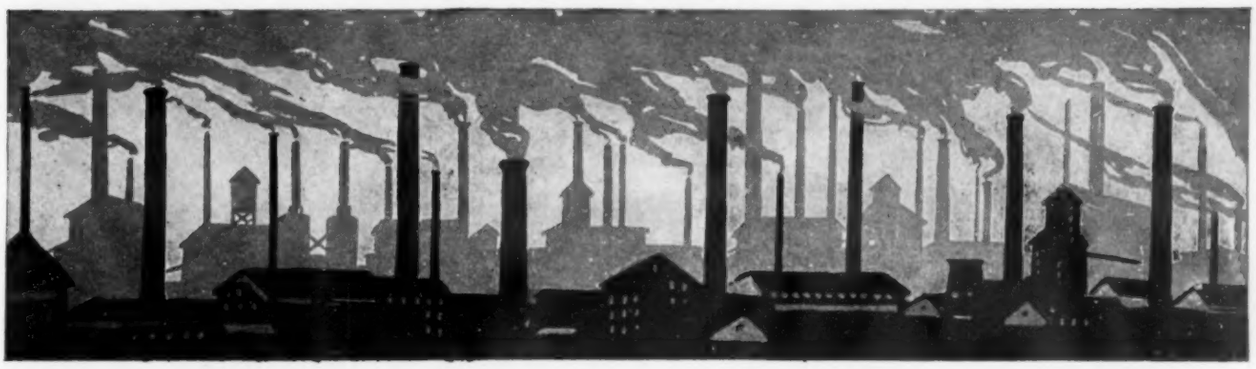

Arguto
Oilless Bearings
for loose pulleys, friction clutches, high speed machinery. Eliminates lubrication—runs from 8 to 15 years without oiling.
ARGUTO OILLESS BEARING CO.
147 Berkeley Street, Wayne Junction, Philadelphia

CRANES For All Purposes
Electric and Hand Power
Case Standard Cranes are the result of thoroughly tested ideas secured during many years from the best designing and operating engineers. They are manufactured under the most favorable conditions in a plant recently equipped at large expense for this particular purpose. They represent the greatest value for price charged.
The Case Crane & Engineering Co.
Columbus, Ohio

BEARINGS
Send for our list of Standard Sizes
THE GWILLIAM COMPANY
253 W. 58th Street, New York

YALE
SPUR-GEARED BLOCK
The Block with Steel Vitals
Yale Construction, Design, Workmanship and final 50% overload test build and assure the guarantee in the block itself. Ask for Book of Hoists.
The Yale & Towne Mfg. Co., 9 East 40th St., New York


Tube Mill Machinery—Seamless and Welded.
Rolling Mill Equipment. Rolls—Sand and Chilled.
Pipe Threading and Cutting Machinery.
Castings—Gray Iron, Semi-steel, Cupola and Air Furnace.
Machine Work to drawings.
Standard Engineering Works, Ellwood City, Penna., U. S. A.



# FULL POWER

Everywhere in your plant where belts are used to transmit power you can employ Rusco Belting with real economy. Rusco solid woven belting does the work because it delivers *full power.*

# RUSCO BELTING

has the necessary tensile strength, the minimum of stretch, every essential belting quality demanded of a belt.

Made absolutely water, oil and steam proof—to match factory conditions.

Conveyor Belts, Transmission Belts, Endless Polishing Belts; in fact for every belting need there is a Rusco product.

***Write for data about plants that use Rusco Solid Woven Belting profitably***

**THE RUSSELL MANUFACTURING CO.**

Home Office and Factories **511 Russell Avenue**
**Middletown, Connecticut**

NEW YORK CITY 349 Broadway
CHICAGO 1438 Michigan Avenue
DETROIT 18 Alexandrine Ave., E.
ATLANTA: 60 So. Forsyth Street

**RUSCO**

38 Factory Bldgs.

25,000 Shuttles

# 11 Years of Service

Since 1908, this 50-inch, 3-ply "Flintstone" Leather Belt has been the main drive in the wash house power plant of one of the largest sugar refining plants in the world. It doesn't show any signs of service. So far as can be judged, it is still good for another 11 years, and then another.

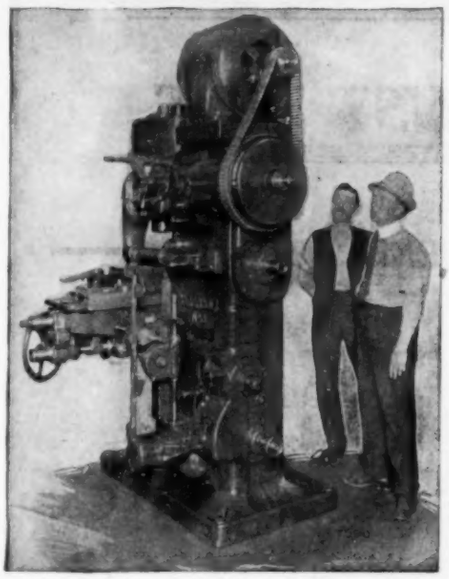
This belt was bought for service—selected for the work it had to do—installed properly—and cared for right. **It is another example of good belting plus belt engineering.** It is another proof that Ladew Leather Belting supplemented by Ladew Engineering Service gives any belt user positive assurance of **the lowest belting cost per horsepower per year of service.**

EDW. R. LADEW CO., INC.
GLEN COVE, NEW YORK, U.S.A.

**Branches and Distributors in all Principal Cities of the World Carry Complete Stocks.**

A.P.42

# LINK-BELT
# SILENT CHAIN DRIVES



## For Machine Tools

DRIVE your machine tools with the efficicnt Link-Belt Silent Chain Drive. In addition to a 20% greater output and a 20% saving in power, you get from four to five times the service on cutting tools, and better finished product.

Remember the following facts about Link-Belt Silent Chain Drives.

1. It is 98.2% efficient (on actual test).
2. Permits convenient location of driving parts.
3. Any reduction in speed is possible.
4. Uniformity of product.
5. Less wear and tear on cutting edges of tools.
6. Increases production.
7. Results in economy of power.
8. Occupies little space.
9. Oftentimes lowers first cost of motors, on account of large speed reduction possible.
10. Oftentimes reduces horse power and cost of motor required.
11. Not restricted to motor drives, but suitable, for instance, for driving from shaft to shaft, as integral parts of machines.
12. Overloads taken care of without diminution of speed.
13. Our casings assure "Safety First" to all employees.

## LINK-BELT COMPANY

367

| PHILADELPHIA | | CHICAGO | | INDIANAPOLIS | |
|---|---|---|---|---|---|
| New York | 299 Broadway | Cleveland | 429 Rockefeller Bldg. | Los Angeles | 163 N. Los Angeles St. |
| Boston | 49 Federal St. | Detroit | 932 Dime Bank Bldg. | Toronto, Can. | Canadian Link-Belt Co., Ltd. |
| Pittsburgh | 1501 Park Bldg. | Minneapolis | 418 S. Third St. | Denver | Lindroth, Shubart & Co., Boston Bldg. |
| St. Louis | Cent'l Nat'l Bank Bldg. | Kansas City, Mo. | 306 Elmhurst Bldg. | Louisville, Ky. | Frederick Wehle, Starks Bldg. |
| Buffalo | 547 Ellicott Square | Seattle | 576 First Avenue, S. | New Orleans | C. O. Hinz, Hibernia Bank Bldg. |
| Wilkes-Barre | 20 Nat'l Bank Bldg. | Portland, Ore. | First and Stark Sts. | Charlotte, N. C. | J. S. Cothran, Com'l Bank Bldg. |
| Huntington, W. Va. | Robson-Prichard Bldg. | San Francisco | 582 Market St. | Birmingham, Ala. | S. L. Morrow, 720 Brown-Marx Bldg. |

*Look for the name on the washers; Look for the liners in the joints.*

***Fill in the data—clip the coupon and mail it today. It places you under no obligation and brings you prices and information on Silent Chain Drives***

367

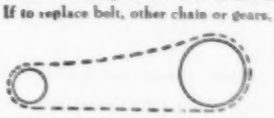
**Link-Belt Company** (Date)_____

Please send us quotation for a silent chain drive to operate. _____
We give the following to enable you to figure closely:

**Maximum H-P to be transmitted**_____
**Dis. from center to center of shafts**_____

| | DRIVER | DRIVEN |
|---|---|---|
| Diam. of Shafts | | |
| Revolutions per minute | | |
| Max. Wheel Diam. | | |
| Max. Wheel Width (Space on Shaft) | | |
| Split, Yes or No | | |
| Key Seat | | |

**Is the load steady, or intermittant as with pumps?**_____
**Is the chain used in a clean or dirty place?**_____
**Is the chain subject to shock?**_____
**How many hours per week will it operate?**_____
**What percentage of time at full load?**_____
**Are there means of adjusting centres?**_____
**If there is a longitudinal float or movement, give amount?**_____
**If to replace belt, other chain or gears, describe same.**_____



Indicate Position of Drive and Direction of Rotation
MARK DRIVER WHEEL "R"
MARK DRIVEN WHEEL "N"

**Draw line showing relative position of floor**

*Name* _____
*Street Address* _____
*Town and State* _____

☐ **Please send us literature on the Link-Belt Silent Chain Drive**

## It's Cheaper to Buy Spacers

**Spacers for Milling Machine Arbors, etc.**

For arbors of the following diameters, ½, ⅝, ¾, ⅞, 1, 1⅛, 1¼, 1⅜, 1½, 1⅝, 1¾, 1⅞, 2, 2¼, 2½ and 3½ inches.
.003, .005, .015 and .025 inch thicknesses in stock.
.0015 to 3.000 inch thicknesses made to order.

**Prices and Samples on Request.**

**Detroit Stamping Company**
**951-957 West Fort Street, Detroit, Mich.**

# BOOKLET
## ON BALANCING
## *JUST OUT*

**SEND FOR IT**

***"We study and eliminate vibrations"***

**Vibration Specialty Co.**
**Harrison Building, Philadelphia, Pa.**

**Titeflex** ALL-METAL **TUBING**
REG. U.S. PAT. OFF.

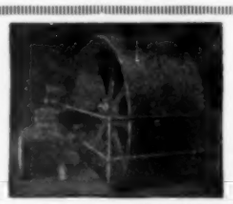
Write for literature

For gasoline, oil, air, etc. Extremely flexible, permanently tight. No packing to wear out or disintegrate; delivers a clean fluid. Absorbs vibration; will not crystallize and break. Any lengths and couplings. Easy to install.

**Titeflex Metal Hose Corporation**
**Badger Ave. and Runyon St., Newark, N. J.**

471 Bourse Bldg., Philadelphia
1421 Ford Bldg., Detroit
550 McCormick Bldg., Chicago

**FRANCKE** FLEXIBLE COUPLINGS
For Direct-Connected Machinery Shafts
**Smith & Serrell, 138 Cedar St., New York**
For Line Shafting
**PINTITE** RIGID COUPLINGS
*Send for bulletins*

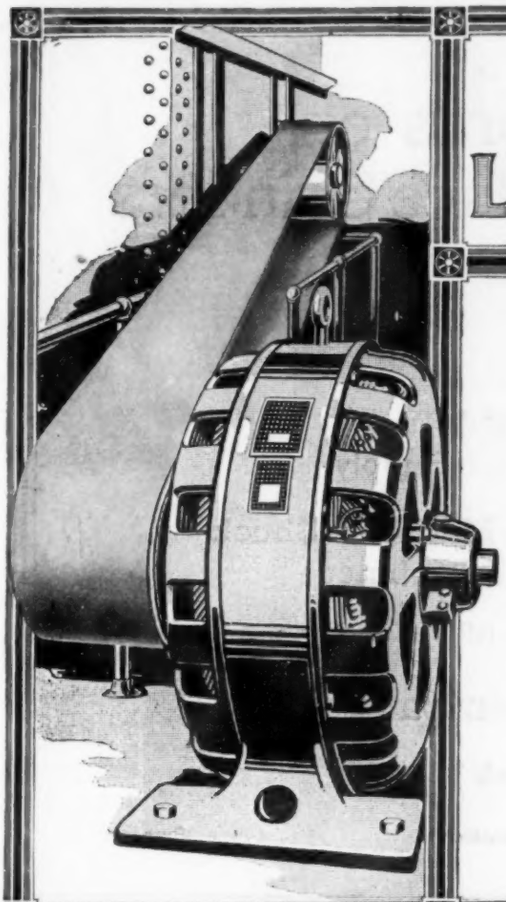


**Belt Users Book Free**
To help you get the most from your belts. It contains valuable information.
Write for a copy gratis.
**J. E. RHOADS & SONS**
*Makers of Rhoads Leather Belts*
PHILADELPHIA.....33 N. Third St.
NEW YORK.....123 Beekman St.
CHICAGO.....343 W. Randolph St.
Factory and Tannery: Wilmington, Del.

**A YEAR WITHOUT OILING**

That's how Warren's Universal Joints run. Non-fluid grease does the trick.
*Write today for Catalog and price list.*
**The Mutual Machine Company,** 29 Wells Street, Hartford, Conn.

**Rossendale-Reddaway**
SINCE 1890
SOLE MAKERS OF
CAMEL HAIR BELTING
**FABRIC BELTS for EVERY SERVICE**
The Rossendale-Reddaway Belting & Hose Co. Newark, N. J.



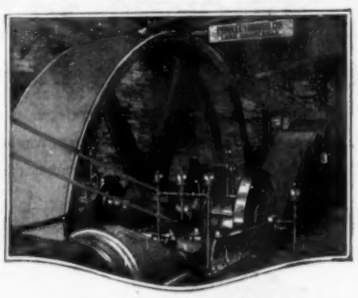
# NEW YORK LEATHER BELTING CO.

## Leather Belting is Superior

Properly tanned leather belting is the most practical and economical because: 1st, it grips the pulley more firmly than other belting material—there is less slippage—consequently more power delivered. 2nd, after years of service it can be cut down or lengthened for use on machines other than the one it originally drove. 3rd, it can be easily repaired.

N.Y.L.B. Leather Belting is Oak tanned by the long-time vat process.

**New York Leather Belting Company**
**Kent Ave. and South 11th St.**
**Brooklyn, N. Y.**
**Chicago: Office 32 So. Jefferson St.**



*34-in. GraKnight 3-ply Belt in the plant of the Powell Lumber Co., Lake Charles, La. 14 ft. Drive Pulley, 136 R.P.M. 52-in. Driven Pulley, Belt Speed 5900 F.P.M., 443 horse power.*

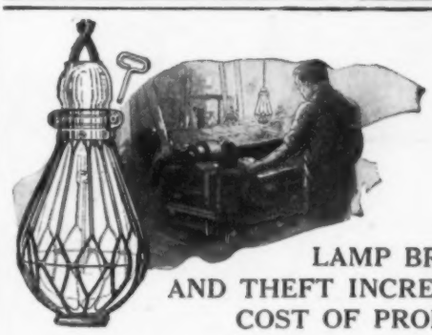
## Triple Insurance

A belt is a beast of burden that can spill a large part of its load without your eye perceiving it.
Here is a belt traveling at a speed of over a mile a minute. At more than a revolution per second, think how even little leaks would foot up a big total if this were not the proper belt for the work to be done.
All G. & K. Standardized Series Leather Belts give triple insurance against leaks because each is standardized in its manufacture and standardized for its work.

*Write for Book "Standardized Leather Belting."*

**THE GRATON & KNIGHT MFG. CO.**
Worcester, Mass., U. S. A.
***Oak Leather Tanners, Makers of Leather Belting and Leather Products***
*Branches and Distributors in all Principal Cities.*

**Graton & Knight**
**Standardized Series**
**Leather Belting**
*Tanned by us for belting use*



**LAMP BREAKAGE AND THEFT INCREASE THE COST OF PRODUCTION**

Protect your lamps from breakage or unauthorized removal by using

**Flexco-Lok Expanded Steel Lamp-Guards**

Flexco-Lok Lamp Guards effectively protect the lamp against any sudden shock to which it may be subjected.

Flexco-Lok is very simple in construction and is easily adjusted. It is LOCKED with a key which prevents theft.

A single broken or stolen lamp costs more than a guard. Install Flexco-Lok Lamp Guards now.

**FLEXIBLE STEEL LACING CO.**
*Manufacturers of*
**"ALLIGATOR" Steel Belt Lacing**
*Dept. LG-3.*
**522 So. Clinton St., Chicago, Ill.**

# High Production Records on Blanchard Vertical Surface Grinders

Are assured by

Powerful Drive
Massive Design
Easy Control
High Work Speeds
Ample Water Supply

Large Size, Revolving, Waterproof, Magnetic Chuck
Continuous Reading Caliper Attachment

User, factory or our representative can tell you more.

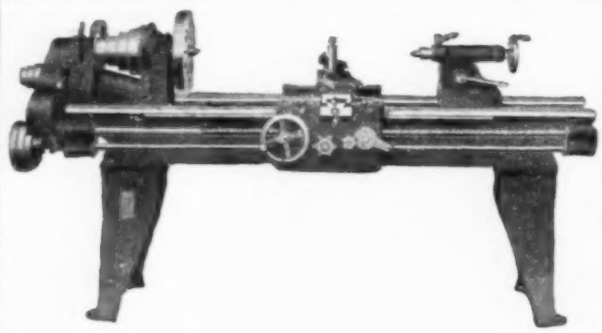
## Henry Prentiss & Company

INCORPORATED

149 Broadway, New York

Warehouse: Jersey City

Boston Buffalo Rochester Syracuse



# UNION LATHES

MANUFACTURED BY THE

## Union Lathe Works, York, Pa., U.S.A.

The Union Lathe is well constructed and specially designed for garage and machine shop work and can be obtained at a moderate price.

It is entirely equipped—with a large and small face plate, follow rest, tool post, centers, double-friction countershaft, rod and screw feed and all necessary change gears, wrenches, etc. (See cut) made in various sizes.

*Write for complete descriptive literature and prices.*

## THE UNION LATHE WORKS

York, Pa., U. S. A.

# The WICKES 17-in.

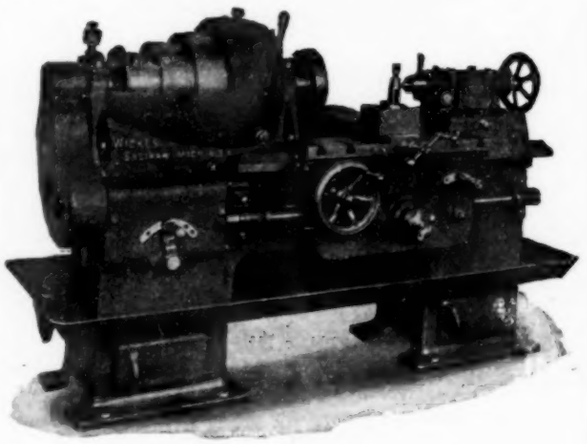
## Rapid Production Heavy Duty Lathe

STRENGTH and rigidity, with a pull that is surprising.

ACCURACY, extreme precision and a duration of these conditions.

CONVENIENCE in the operation of a powerful instantaneous friction stop and start.

DURABILITY as to strength of parts remains unquestioned.
Our other lines of various sizes, all heavy duty, will interest the most exacting purchaser.



## WICKES BROS., Saginaw, Mich.

Agents: Wickes Bros., Seattle, Washington; Rolph, Mills & Co., San Francisco and Los Angeles, Calif.; Dale Brewster Machinery Co., New York City and Chicago Ill.; Badger-Packard Machinery Co., Milwaukee, Wisconsin; P. H. McArdle, New Orleans, Louisiana; Davies Morand Machinery Co., Detroit, Michigan; McCoy-Brandt Machinery Co., Pittsburgh, Pa.

Foreign Agents: Dale Brewster Machinery Co., France, Belgium and Italy

# MULLINER

## "Does Good Work" — *they say*

That is the opinion of the lathe experts at the Three Units Engineering Corporation, New York City.

The Mulliner is shown here cutting a worm.

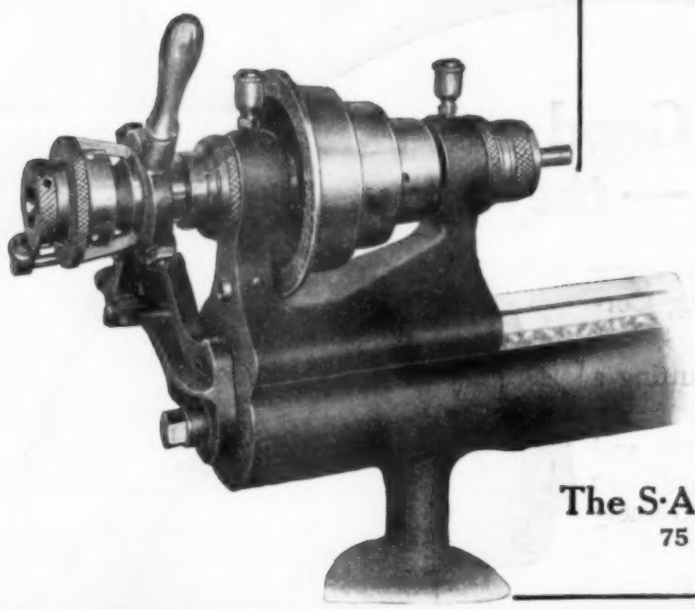
This lathe is unusually accurate and rapid. It is easy to operate, and is so well built the upkeep is extremely small.

**Let us furnish you with complete information.**

## The Porter-Cable Machine Co., Syracuse, N. Y.

The Strong, Carlisle & Hammond Co., Cleveland, Detroit. Homer Strong, Rochester, Buffalo. David A. Wright, Chicago. The Patterson Tool & Supply Co., Dayton. Badger-Packard Machinery Co., Milwaukee. Patterson, Gottfried & Hunter, Inc., New York. The Sunderland Machinery & Supply Co., Omaha. D. Nast Machinery Co., Philadelphia. Somers, Fitler & Todd Co., Pittsburgh. The Brown-McDonald Machinery Co., St. Louis. H. W. Petrie, Ltd., Toronto. The Geo. F. Foss Machinery & Supply Co., Montreal. Burton, Griffiths & Co., Ltd., London. Hendrie & Bolthoff Mfg. & Supply Co., Denver. Portland Machinery Co., Portland, Ore. Perine Machinery Co., San Francisco. Harold A. Wright, Boston. **Export Representative:** Benjamin Whitaker, Inc., 21 State St., New York; Vulcan House, 56 Ludgate Hill, London, E. C

# It Grips—
# It Releases—
# In An Instant



S·A·POTTER NEW YORK BENCH LATHES

For the rapid handling of duplicate work, the holding and releasing attachments must be smooth working and speedy in action. If your product is of this class, the Improved Lever Chuck Closer attached to the

## POTTER
## Precision Bench Lathe

is a necessity in your manufacturing department. It takes the place of a regular draw-in sleeve for instantaneously holding or releasing the work while the machine is in motion. A special arrangement is provided by means of which the spring chuck is actually opened when releasing the tension on the draw sleeve.

The device is attached to the lathe by means of a single bolt. Send for catalog showing Potter Precision Specialties. You will be surprised at their range.

**The S·A· Potter Tool & Machine Works**
**75 East 130th Street, New York City**

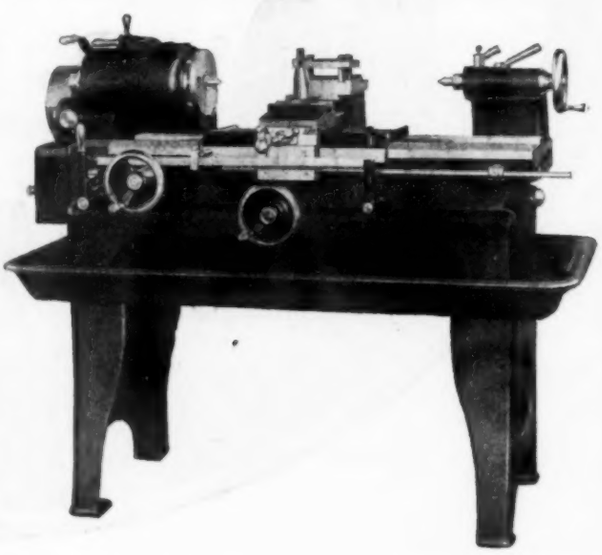
# The Sundstrand—
## a Lathe of Multiple Features

For the rapid duplication of parts, this plain manufacturing lathe has made remarkable records. The simplicity of its construction, and its sturdy, reliant features make it particularly capable of performing tasks which would ordinarily require a lathe of approximately twice the floor space and proportions.

The Sundstrand Lathe has, among its exclusive features, a set of extra ways on the bed, which permit the carriage to travel to the extreme end of the bed, to the front of the tail stock. With separate vees, it is possible to run the tailstock directly back of the carriage, thus permitting small work to be done, which could not ordinarily be accomplished on the average lathe.

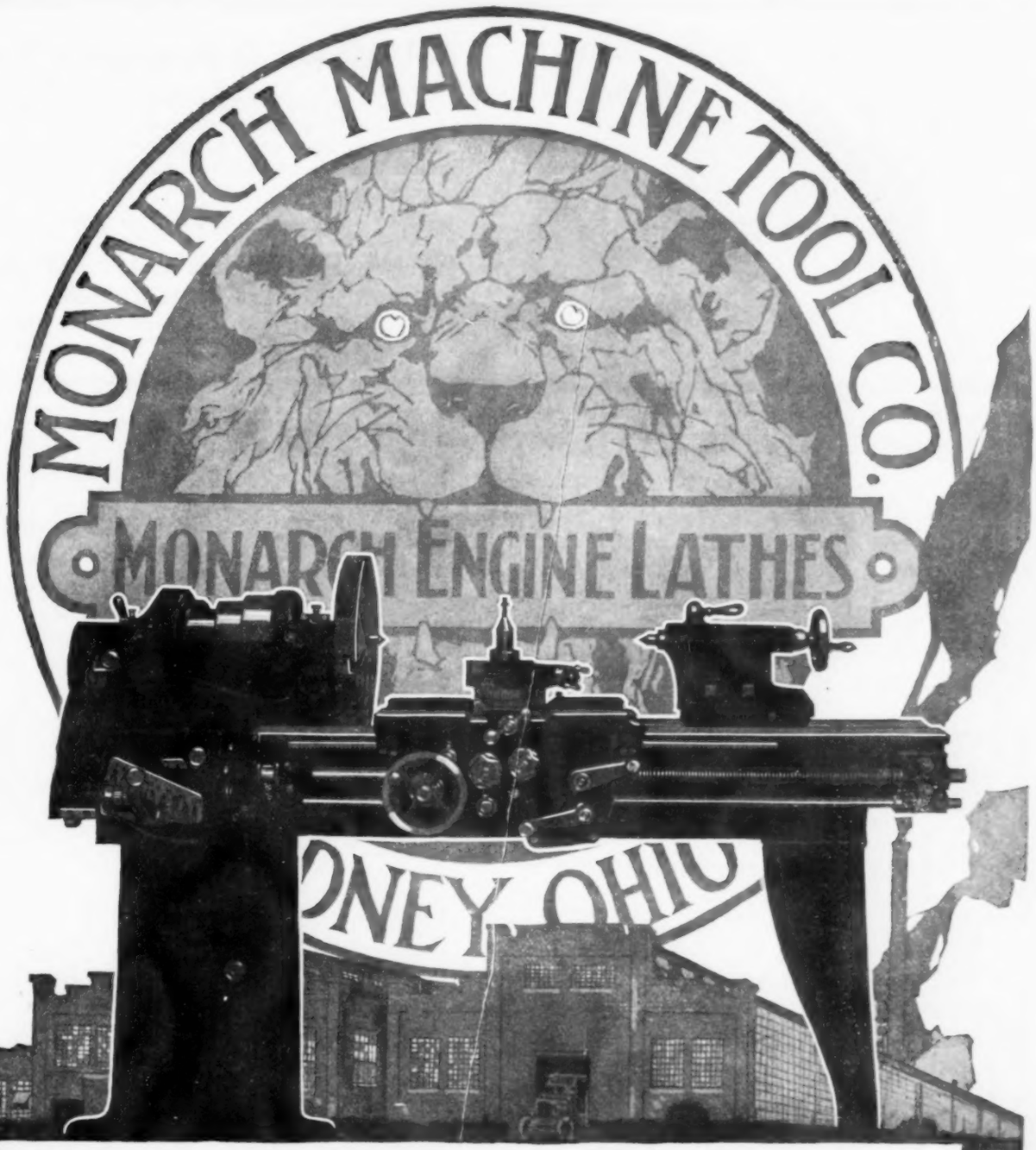
A bulletin containing full details will be sent for the asking.

**Rockford Tool Company**
**Harrison Ave. and Eleventh St.**
**Rockford, Ill., U. S. A.**



**Specifications Include:**

**Swing over bed, 9 in.; over plain rest, 7 in.; distance between centers, 12 in.; hole through spindle, 1 3/8 in.; diameter of drive pulley, 8 1/2 in.; speed 350 R.P.M.; spindle speeds, 12; feeds, 4; *floor space only 45 in. x 24 in., etc.**




# MONARCH—KING *of* Lathes

THERE are more Monarch Lathes built and sold each year than are produced by any other manufacturer of high grade Lathes. There is a reason for this evidence of Monarch superiority and leadership.

Quantity production enabling quantity purchase made possible the use of the highest grade materials obtainable at a considerably lowered cost and the ultimate marketing of the finished product at a price much lower than that customarily asked for a product of equal merit. Emphatically a point in Monarch leadership.

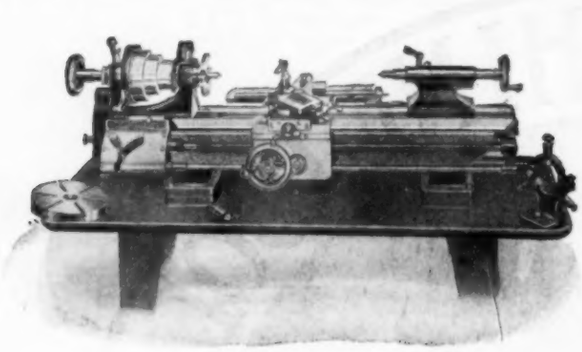
The list of users of Monarch Lathes reads like a blue book of American Manufacturers. These most discriminating buyers prove Monarch leadership.

These purchasers buy no product because of price. The purchase is based on merit—ability to deliver production—accuracy of work performed and evidence of stamina in the product itself.

Specify "Monarch Lathes" in your next order of machine shop or tool room equipment.

*Send for Catalog.*

**THE MONARCH MACHINE TOOL CO., 106 Oak St., Sidney, O.**



## Tool Makers' Precision Lathe

Which combines extreme accuracy with strength and adaptability. Unexcelled for tool and scientific work such as jig, die, instrument and fine gun part manufacture. A sturdy, accurately and beautifully finished machine with many distinct improvements.

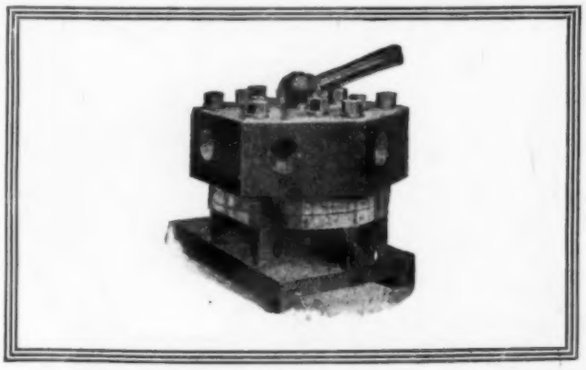
***Shall we send our catalogue?***

**THE WADE-AMERICAN TOOL CO.**

**309-311 Atlantic Ave., Boston, Mass., U. S. A.**

Successors to W. H. Wade of Boston American Watch Tool Co., of Waltham

---



IF you're practical and know the value of turret lathes. Why not transform your engine lathes into turrets?

## Phoenix Turret Tool Post

will quickly transform your engine lathe into a turret lathe and work can be done without a single delay for tool change.

***Let us send you details.***

**Phoenix Manufacturing Co.**

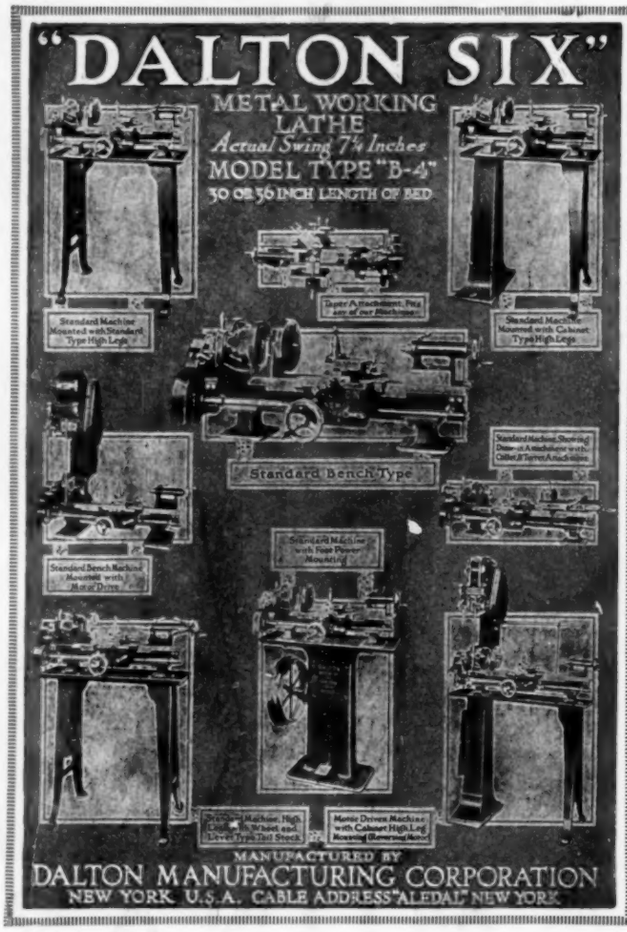
**Eau Claire, Wis.**

**Eastern Representative:**

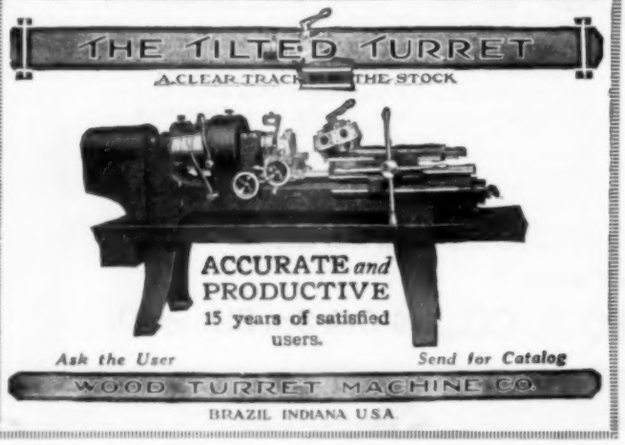
**W. L. HARRISON**

**913-915 Engineers Bldg., Cleveland, Ohio**

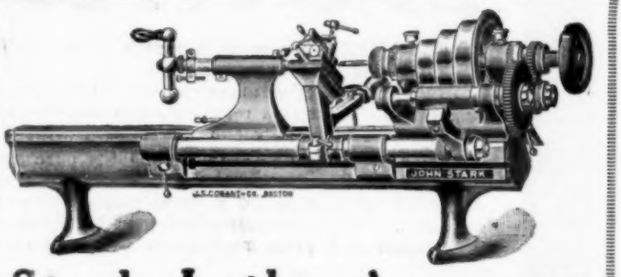
---




---




---




## Stark Lathe Accuracy

is known and appreciated wherever finest bench tools are used. We have had 45 years' experience in building these lathes and we can guarantee their efficiency absolutely.

*Ask today for our descriptive Catalog No. 29.*

**Stark Tool Company, Waltham, Mass.**

# Three Instantaneous Speed Changes to any step on the Cone Pulley—

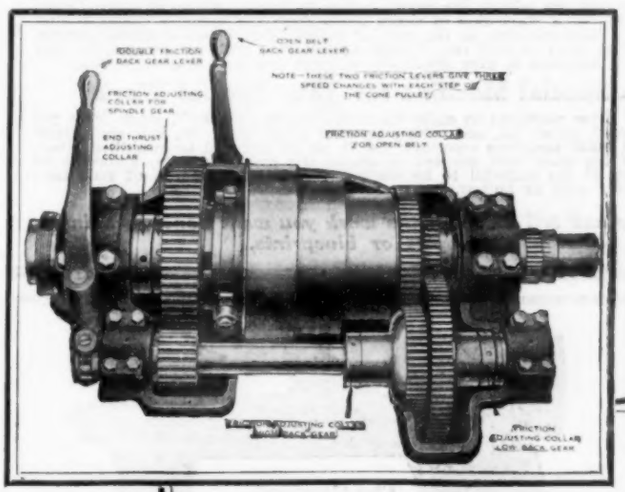
TURRET MILLHOLLAND LATHES

This is a point of the Millholland Turret Screw Machine which other screw machines do not possess. The fact that an instantaneous change to any of three speeds may be made, from any step on the cone pulley, is a factor whereby sufficient time in seconds may be saved, on a piece requiring variable speeds, that it will amount to hours in the course of a comparatively short while.

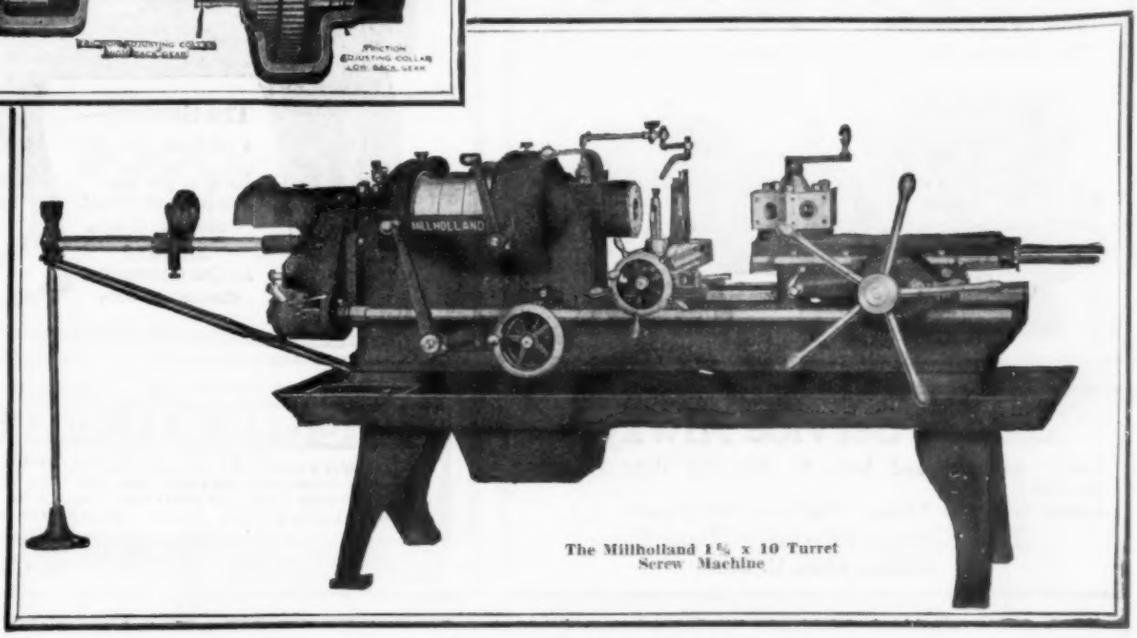
The illustration shows the headstock in detail. It is equipped with double friction back gears, and a three-step cone pulley and drive gear. This gives nine spindle speeds with three spindle speeds instantly available without shifting the belts.

It is an impossibility for an ignorant or careless operator to injure the gears when shifting from speed to speed, for they are always in mesh, engaged by means of powerful cone type friction clutches which may be adjusted to secure any desired torque, or which may be adjusted for wear.

*Our literature goes into further detail. Send for it—it is yours for the asking.*


DOUBLE FRICTION BACK GEAR LEVER
OPEN BELT BACK GEAR LEVER
NOTE—THESE TWO FRICTION LEVERS GIVE THREE SPEED CHANGES WITH EACH STEP OF THE CONE PULLEY
FRICTION ADJUSTING COLLAR FOR SPINDLE GEAR
END THRUST ADJUSTING COLLAR
FRICTION ADJUSTING COLLAR FOR OPEN BELT
FRICTION ADJUSTING COLLAR FOR BACK GEAR

Details of headstock of the Millholland 1⅝ x 10 Turret Screw Machine.




The Millholland 1⅝ x 10 Turret Screw Machine

*Quick Deliveries*

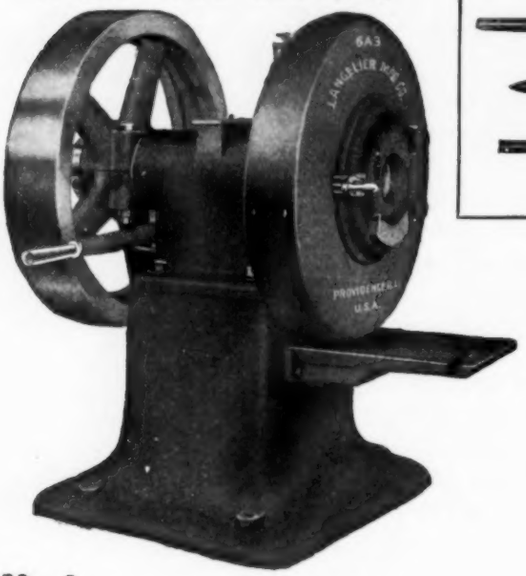
## W. K. Millholland Machine Company

Indianapolis, Ind., U. S. A.

# Rotary Swaging

***for Heavy and Light Duty***

**Will accurately form metal with economy**



SAMPLES OF HOT SWAGING

The Langelier Reducing or Swaging Machine forms different metals without wasting any of the material. It improves the stock by compression, besides preserving same metal on the surface—the best metal, which with any other machine is cut away. In addition to this big economical feature, it is more accurate and more rapid.

In working extremely hard metal, we arrange **these machines to swage the metal hot**, doing much of the work formerly done by trip hammers at a very much higher rate of production, with unskilled labor, at lower cost and with greater accuracy.

## 3000 Blows a Minute Must Mean Rapid Work

Revolving dies are within the round casing in front. These dies are forced on the work by a succession of sharp blows from the hammer blocks behind the dies. These striking at the rate of about 3000 blows a minute reduce the material, such as drill rod, tubing, copper, etc., with great rapidity. The machine is perfected to give absolutely uniform and well finished work.

## A Special Machine for Your Special Work

We build these machines in eight different sizes to take solid stock from pin wire up to 2 inches dia. and tubing up to 4 inches dia. We will study your work and build machines especially for it, to be operated by unskilled labor, producing the blow best adapted to secure the desired results, according to the nature of the material to be worked, its size and amount of reduction, and whether solid or hollow, **hot** or **cold.**

***Write and tell us about the work you want done—sending samples or blueprints.***

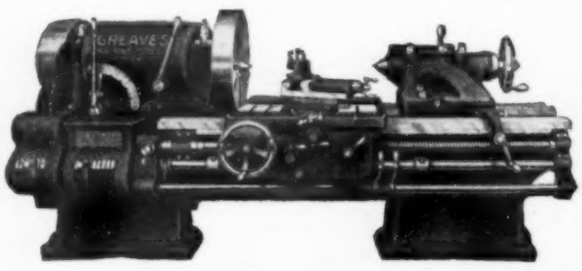
LMCo. **LANGELIER MFG. CO.**

Arlington Cranston, R. I., U. S. A.

## Speed, Power, Durability

All are combined in this Single Pulley Drive Geared Head Engine lathe. It is strong, massive, convenient to operate and has many decided advantages. Made in from 18-in. to 30-in. swing. Write for full particulars.

**The Greaves Machine Tool Company, Cincinnati, O.**



## The Sterling—

a foot power screw cutting lathe with many unusual features for saving in your shop.

Moderately priced too!

**Write for details.**

**Shepard Lathe Company**

Cincinnati, Ohio

## Sidney Service Always

Lathes designed and built to give the right kind of service.

Lathes sold with advice. Particulars on request.

**The Sidney Machine Tool Co.**

Sidney, Ohio, U. S. A.

## CINCINNATI LATHES

have thoroughly demonstrated in shops everywhere what we claim. You take no chances now or years hence when you buy them. Our **Quick Change Feed Box** gives an unlimited range to cut odd or metric threads if desired, besides the standard changes made at once. *Let us figure on your requirements.*

**THE CINCINNATI LATHE & TOOL CO.**

OAKLEY, CINCINNATI, OHIO, U.S.A.

# BROACHES

VELCO

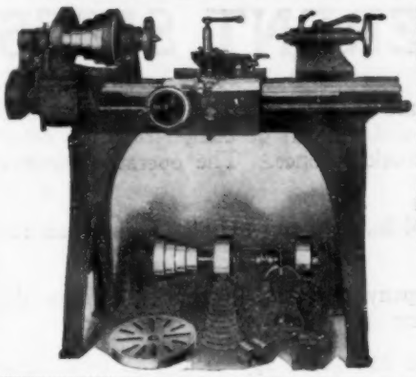
**V. E. Lapointe Mfg. Co.**

Manchester, Conn.

## Velco Service Means Reduced Broaching Cost to YOU

SEND BLUEPRINT FOR ESTIMATE

## WORCESTER LATHES



are built for long profitable service. The kind of service that builds a big balance of satisfaction and profit.

**Cone or geared head pulley at your option. Write for the Bulletin.**

**Worcester Lathe Co.**
**68 Prescott St.**
**Worcester, Mass.**

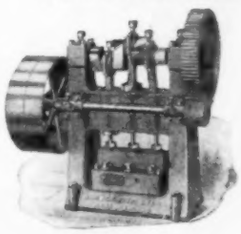
## The Little Lathe for Big Work
### 32 Feed Changes—12 Spindle Speeds

We call it our 14-in. Single Back Geared Lathe, but as a matter of fact it has a swing of 15¼ in. Big Producer for Small Price.

*Write for Bulletin E.*

**The Carroll-Jamieson Machine Tool Co.**
**Davis Avenue, Batavia, Ohio**
Geo. H. Alexander, Birmingham, England.
Agents for the British Isles exclusively.

## HYDRAULIC EQUIPMENT



Not only the Presses, but the Pumps and Valves of a Hydraulic installation need to be exactly adapted to the pressure requirements.

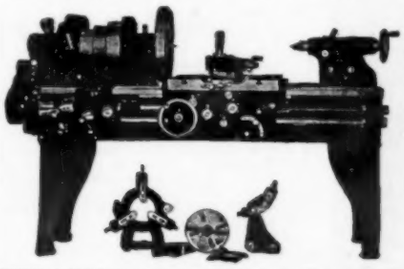
The H-P-M line is the result of 42 years specializing in hydraulic machinery building.

*Write for Catalogs*

**THE HYDRAULIC PRESS MFG. CO.**
*Engineer-Builders of Hydraulic Machinery Exclusively*
**Mount Gilead, Ohio**
*Branch Offices:* **New York City, Cleveland, Pittsburgh, Detroit, San Francisco, Suffern, N. Y.**

## "Economy Lathes"
### True to the Name

*Economical in first cost; Economical to operate; Ideal for tool room and general manufacturing.*



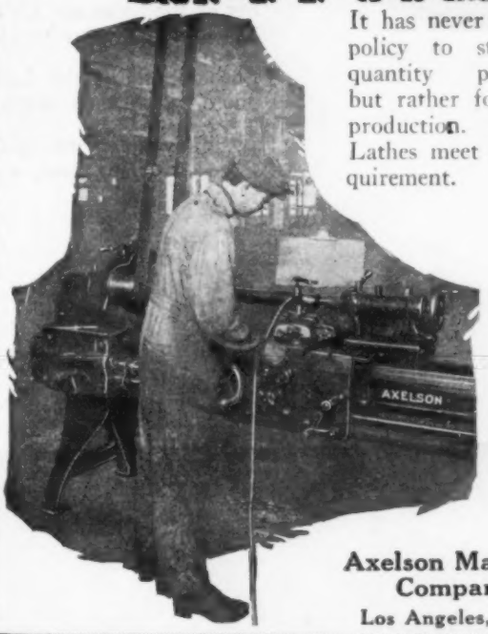
**Made in 14 in. and 18 in. double back geared and semi and quick change.**

***Ask for the details***

**Rockford Lathe and Drill Company**
**Rockford, Ill.**
**U. S. A.**

## 16-in. 18-in. 24-in. AXELSON · HEAVY DUTY · LATHES

It has never been our policy to strive for quantity production but rather for quality production. Axelson Lathes meet every requirement.



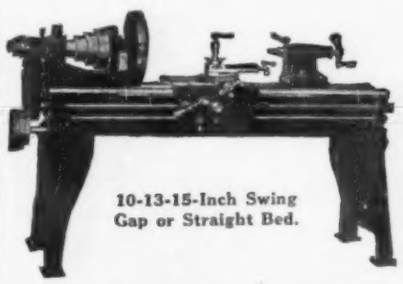

***Ask for full Specifications.***

***Immediate Deliveries.***

**Axelson Machine Company**
**Los Angeles, Calif.**

## SEBASTIAN LATHES

**Medium Priced Good Lathes for 30 years**

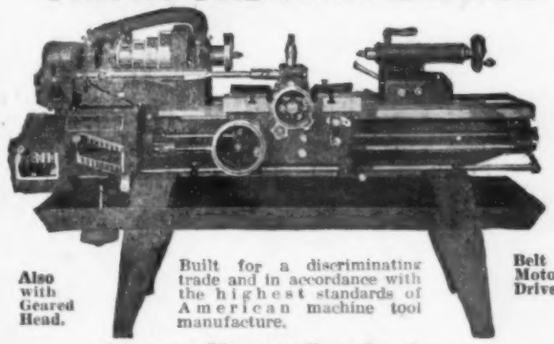


**10-13-15-Inch Swing Gap or Straight Bed.**

*Write for Catalog*

**The Sebastian Lathe Co.**
**117 Culvert St., Cincinnati, Ohio, U. S. A.**

## CRAWFORD 15-Inch Tool Room LATHES



**Also with Geared Head.**

Built for a discriminating trade and in accordance with the highest standards of American machine tool manufacture.

**Belt or Motor Drive.**

**Crawford Machine Tool Co., Inc.**
**21 Park Row, New York**

BAUSH

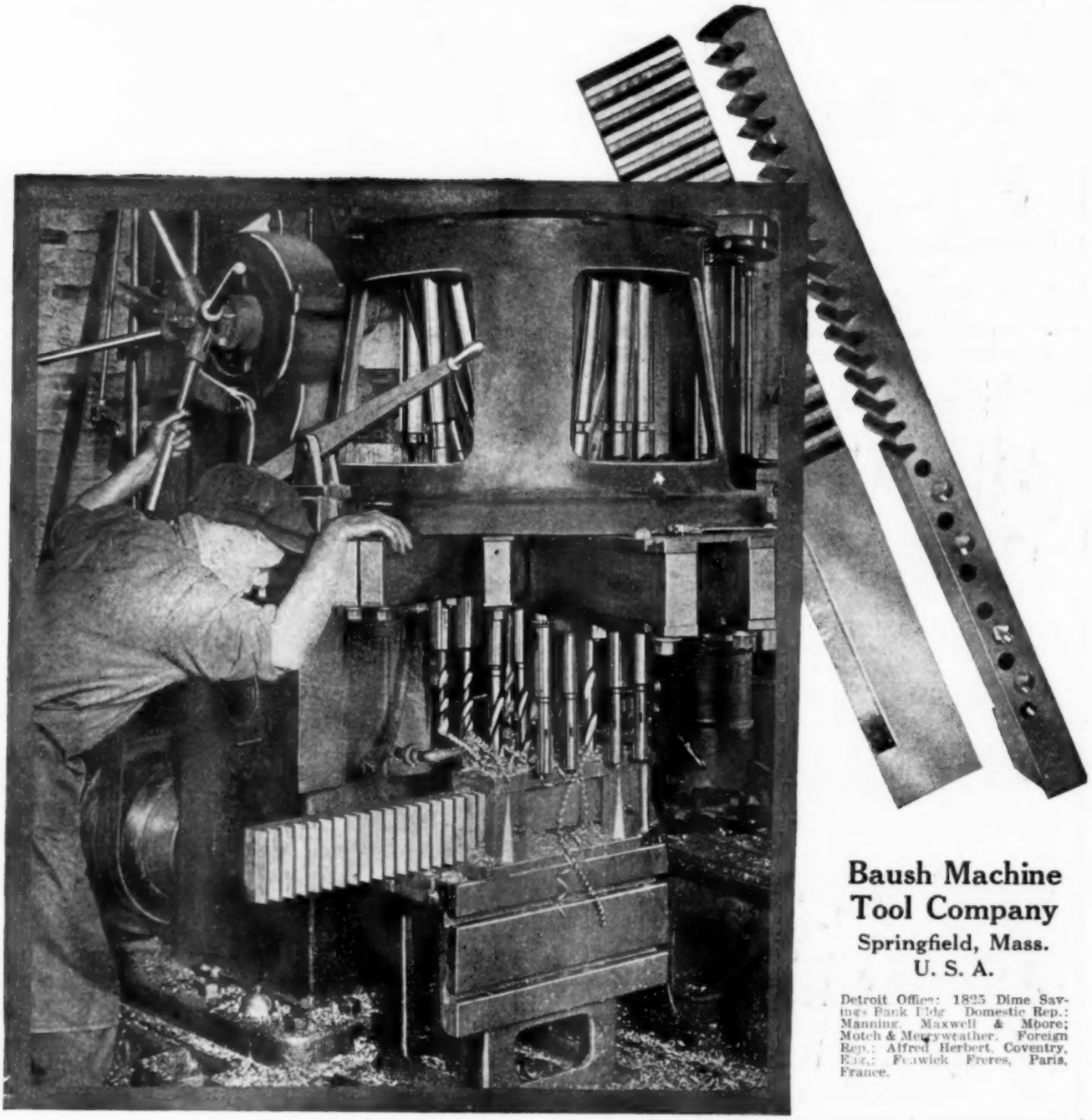
# DRILLING and REAMING HOLES of DIFFERENT SIZES

The camera caught the reamer gang at rest and the drills on the job. It won't be long before this stoker (a main rack duplex stoker) will be completed. No delay when the shift comes. The reamers start work at once. The operator controls the whole mechanism with perfect ease

Six of the holes are 15/16 in. in diameter by 4 in. deep and the other four holes are 1¼ in. in diameter by 1¼ in. deep.

Each Baush at the Locomotive Stoker Company plant at Pittsburgh (where the photo was taken) turns out six of these pieces every hour.

If you want a multiple-spindle machine that has quick approach, fine feed automatic trip; in short, a big product of accurate work—find out about the Baush for your shop.



**Baush Machine Tool Company**
**Springfield, Mass.**
**U. S. A.**

Detroit Office: 1825 Dime Savings Bank Bldg. Domestic Rep.: Manning, Maxwell & Moore; Motch & Merryweather. Foreign Rep.: Alfred Herbert, Coventry, Eng.; Fenwick Freres, Paris, France.

# Range—Accuracy—Speed

These are three of the characteristics of the

## LYND-FARQUHAR DISTINCTLY DIFFERENT WALL RADIAL DRILLS

Although their range is the widest possible, they take up less floor space than radials of the standard type. When not in use they can be put out of the way entirely.

The arm is heavily braced, giving extreme rigidity to the head. This, combined with the advantages of the adjustable take-up, insures accuracy.

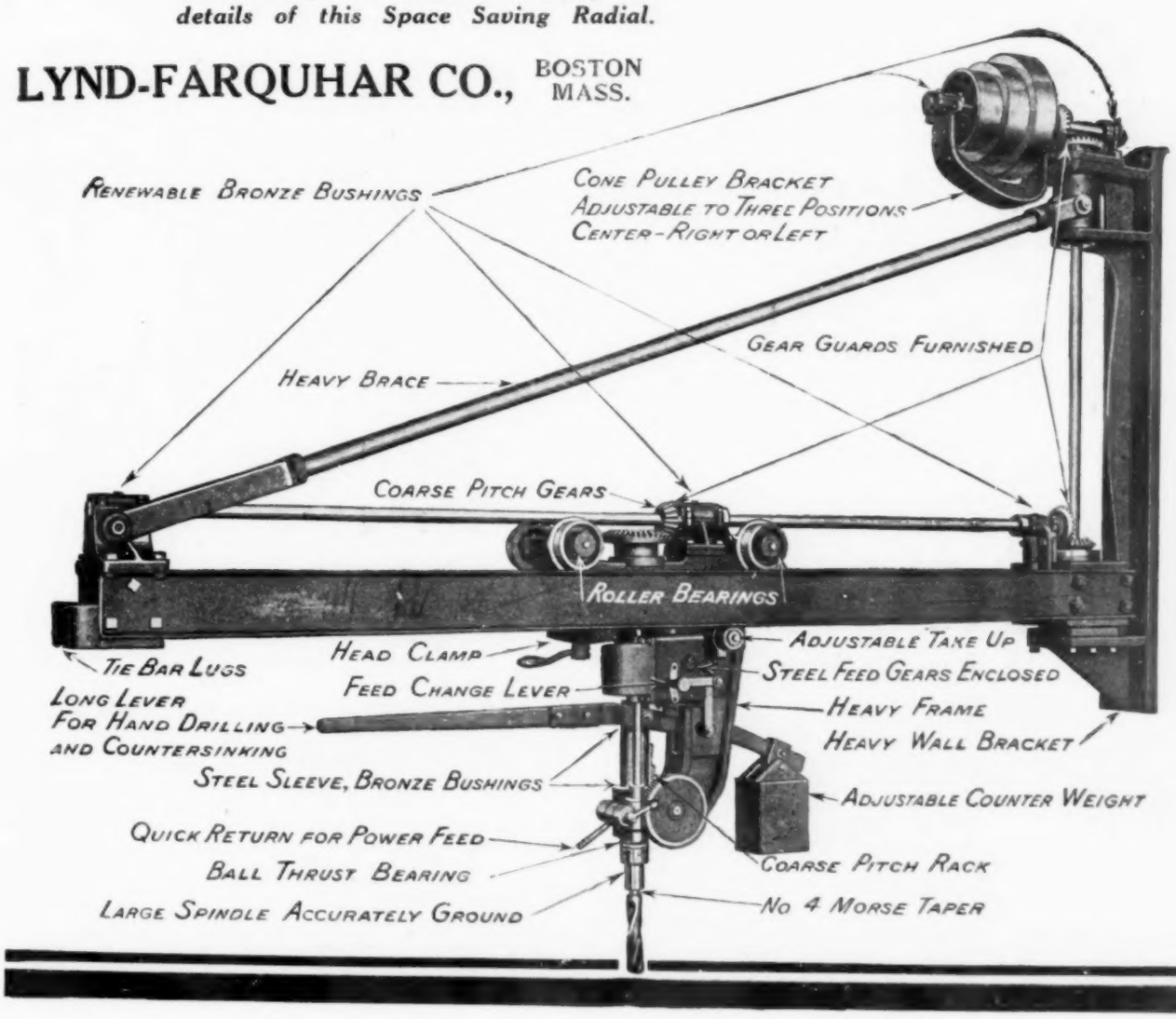
Centralization of control simplifies handling and guarantees speed.

Four standard lengths of arm: 7 ft., 9 ft., 11 ft., 13 ft.

Special length of arm to suit your requirements.

***Write today for bulletin containing full details of this Space Saving Radial.***

## LYND-FARQUHAR CO., BOSTON MASS.

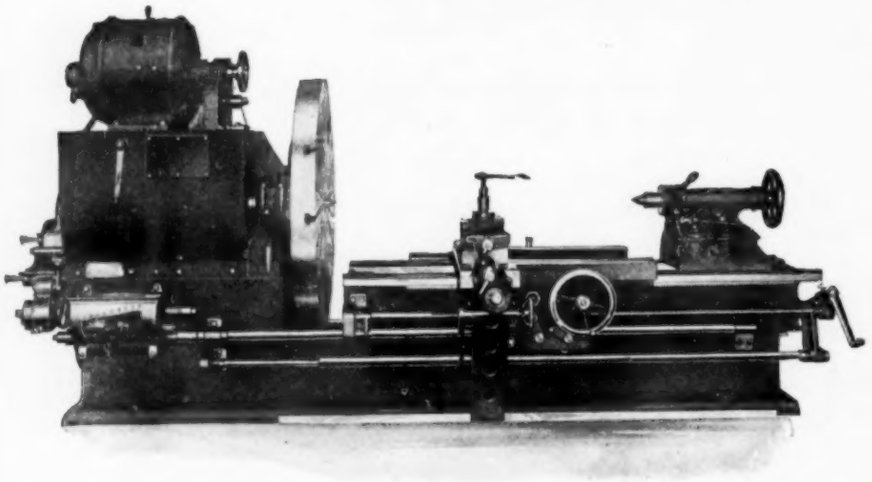


# HARRINGTON

**28-inch -48-inch**

## EXTENSION BED GAP LATHE

**Belt or Motor-Driven**



**5 Lathes in 1**

***Send for Bulletin***

**Edwin Harrington Son & Co.**

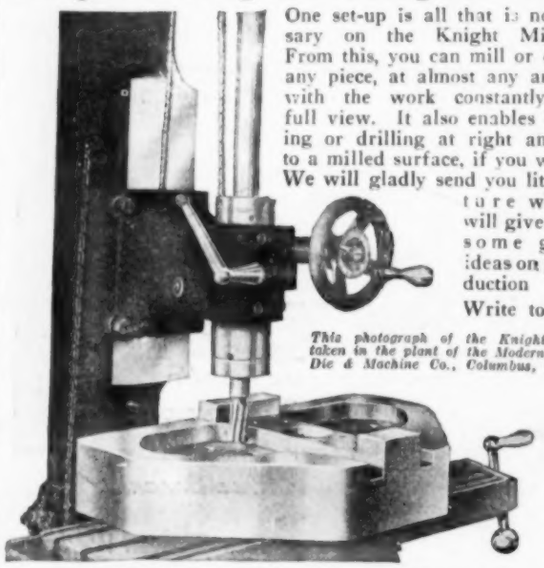
***Builders of Machine Tools Since 1868***

**Philadelphia, Pa.**

## You Can See What You're Doing

*On a*

## Knight Milling & Drilling Machine



One set-up is all that is necessary on the Knight Miller. From this, you can mill or drill any piece, at almost any angle, with the work constantly in full view. It also enables boring or drilling at right angles to a milled surface, if you wish. We will gladly send you literature which will give you some good ideas on production

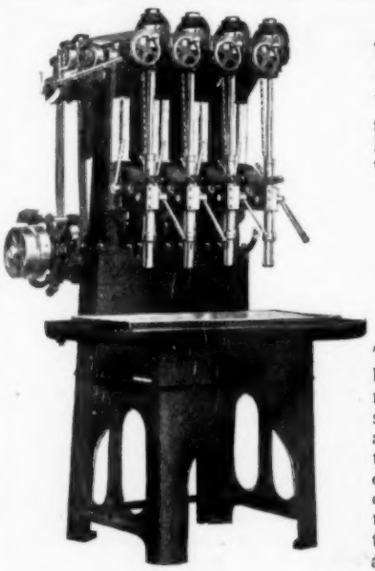
Write to us.

*This photograph of the Knight was taken in the plant of the Modern Tool Die & Machine Co., Columbus, Ohio.*

**W. B. Knight Machinery Company**

**3920 West Pine Boulevard, St. Louis, Mo., U. S. A.**

Coats Machine Tool Co., Ltd., London, 14 Palmer St., Westminster, London, S.W.; Eccles & Smith Co., San Francisco, Pacific Coast; Lynd-Farquhar Company, Boston, Mass.; Manning, Maxwell & Moore, Inc., New York, Chicago and Philadelphia; Patterson Tool Co., Dayton, Ohio; Strong, Carlisle & Hammond Co., Cleveland and Detroit; Somers, Fitler & Todd Company, Pittsburgh, Pa.; Vonnegut Machinery Co., Indianapolis, Ind.; Allied Machinery Company of America, France, Spain, Portugal, Italy, Switzerland, Norway, Sweden, Denmark, and Belgium.



## Speed Up Your Drilling

You can drill your small holes more quickly and more efficiently with the

## Henry & Wright

The special drive and ball bearings give the necessary high spindle speed. Every control and every feature of this machine has been designed with a view of increasing production with less effort on the part of the operator.

Your one aim in buying a drilling machine should be greater output per spindle. You get it in Henry & Wright Drilling Machines. **Our Catalog contains some interesting drilling data. Send for it.**

**The Henry & Wright Mfg. Co.**

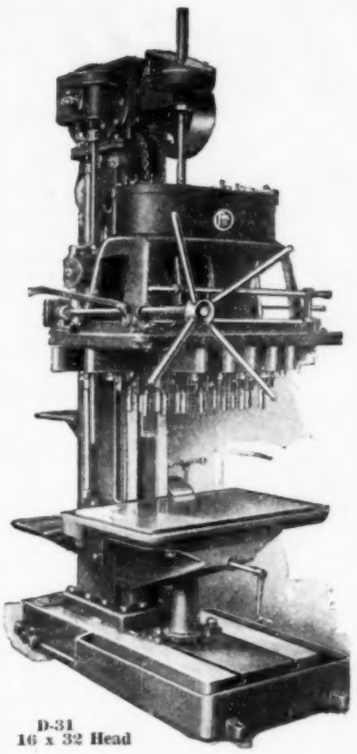
**Hartford, Conn.**

OVER-SEAS REPRESENTATIVE

ALMACOA ALLIED MACHINERY COMPANY OF AMERICA ALMACOA

51 CHAMBERS ST. NEW YORK, U.S.A.

Paris, Turin, Zurich and Barcelona



D-31
16 x 32 Head

# FOX

## Drills Which Banish Gear Troubles

In this new Fox Drilling Machine all gearing which is not absolutely essential to perfect operation has been eliminated.

The distribution of metal insures the maximum strength with the least weight of machine; in this manner we have conserved on material and hence on machine cost.

The Independent Drill Speeds to each spindle enable you to operate different size drills at approximately correct speeds and thereby save on expensive drills.

The machine illustrated is our 31-Drill, having a capacity of sixteen ¾-in. Drills simultaneously in cast iron. Machine is especially adapted for drilling crank cases, cylinders, and like parts.

There are other features that cannot be described here.

We will gladly go into detail if you will but write.

**Write for full information**

**FOX MACHINE CO., Jackson, Mich.**

1803 W. Ganson Street

Formerly of Gran. Rapids, Mich.

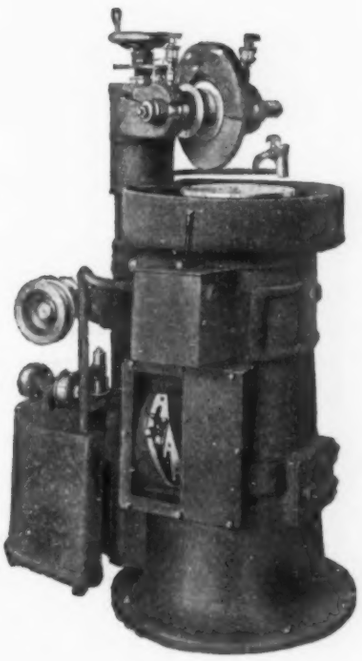
# Service

This Bristol 12-in. Rotary Surface Grinder has exceptionally long bearings in all places, especially the back column which is so constructed that the wear is so slight as not to affect the accuracy of the machine.

Its quality construction means a long service machine.

Its range of capacity is work of the smallest size up to anything that will come within a 12-in. circle and not thicker than 6 in.

***Write for Bulletin 10-G, giving full details.***

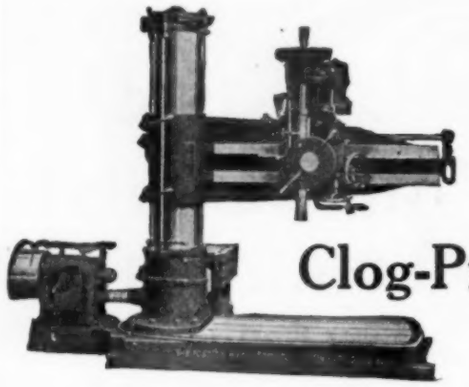


BRISTOOL

## The Bristol Machine Tool Co.

Successors to C. G. Garrigus Machine Co.

**Bristol, Conn., U. S. A.**



## Clog-Proof

That drilling department is immune to hold-up that can boast of at least one

**FOSDICK heavy duty radial**

Built in two styles, seven sizes; 2 to 6 foot—it will increase production in any shop.

Drive through speed box, cone pulley or motor—drives are interchangeable.

Get the catalog and note its many time and money saving features.

**The Fosdick Machine Tool Co.** Cincinnati, Ohio

Riggs-Watterson Co., Cleveland, Ohio. Colcord-Wright Mchy. & Supply Co., St. Louis, Mo. Eccles & Smith Co., San Francisco, Cal.; Los Angeles, Cal.; Portland, Oregon. Fairbanks Co., New York City, N. Y.; Hartford, Conn.; Albany, N. Y. E. A. Kinsey Co., Cincinnati, Ohio; Indianapolis, Ind. Homer Strong, Rochester and Buffalo, N. Y. Peninsular Machinery Co., Detroit, Mich. H. A. Smith Machinery Co., Syracuse, N. Y. Swind Machinery Co., Philadelphia, Pa. Somers, Filter & Todd Co., Pittsburgh, Pa. Stocker-Rumely-Wachs Co., Chicago, Ill.; Milwaukee, Wis. Taylor Machinery Co., Boston, Mass. A. R. Williams Machinery Co., Ltd., Toronto, Ont., Canada. Burton, Griffiths & Co., London, England. Fenwick Freres & Co., Paris, France. Wynmalen & Hausmann, Rotterdam, Holland. Rylander & Asplund, Stockholm, Sweden. Wilh. Sonnesson & Co., Malmo, Sweden; Copenhagen, Denmark. Roku Roku Shoten, Tokyo, Japan. R. L. Scrutton & Co., Sydney, Australia.

## The Avey

**No. ½ Bench Drill**

**12000 R.P.M. Speeds**

The use of small high-speed twist drills on some drilling machines is a continuous expense, due to the fact that they are not driven fast enough to cut continuously, and therefore break or snap very easily.

The Avey No. ½ Bench Drill overcomes this expense because sufficient speeds can be obtained for all requirements. It also reduces drill grinding from 50 to 60 per cent.

***Our bulletin will interest you. Write for it today.***

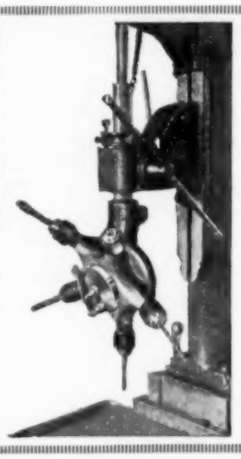
**The Cincinnati Pulley Machinery Co.**
**Cincinnati, Ohio**

## Time Saved Is Money Earned

Barnes all-geared drills have no old, time-wasting, trouble-making belts which enables the operator to forget the machine and concentrate on the work. 8 geared speeds, 8 geared feeds.

**Barnes Drill Co.**
Inc. 1907.
**830 Chestnut Street**
**Rockford, Ill., U. S. A.**

AGENTS FOR GREAT BRITAIN: Burton, Griffiths & Co., Ltd., London, E. C. FRANCE: R. S. Stokvis & Fils, Paris. JAPAN: Roku-Roku Shoten, Tokio. ITALY: Alfred Herbert, Ltd., Milan. SPAIN: American Machinery Syndicate, New York, Barcelona, Madrid, Seville, Bilbao, Gijon, Santander. NEW SOUTH WALES: R. L. Scrutton & Co., Sydney. BELGIUM: G. & F. Limbourg Freres, Brussels.



## Multiplies Spindle Capacity 5 Times

**Fortin Turret Drill Head**

This simple 5-Spindle Turret Drilling Head saves much time where tools of various sizes are used on the same piece. Takes but little more room than a chuck and is indexed very quickly by simply pressing lever at the front. Simple, compact and strong. Made in 5 sizes up to 2-inch drill.

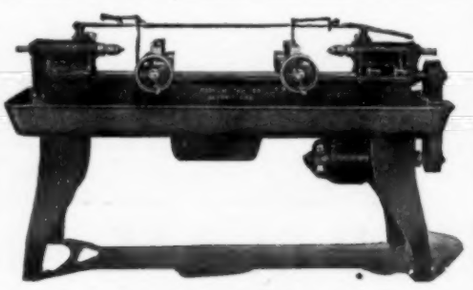
***Write for details.***

**Spafford Tool Works**
**10 Hoadley Pl., Hartford, Conn.**

# CADILLAC DOUBLE-END DRILLING AND CENTERING MACHINE

You can increase your output 100% with the Cadillac. Wherever drilling or centering is required at opposite ends, this double-end design can handle both jobs simultaneously. 12, 24, 36, 48 or 60 inch work can be handled between centers. For longer pieces remove the left hand head. Belt or motor driven.

**Find out about the Cadillac today.**

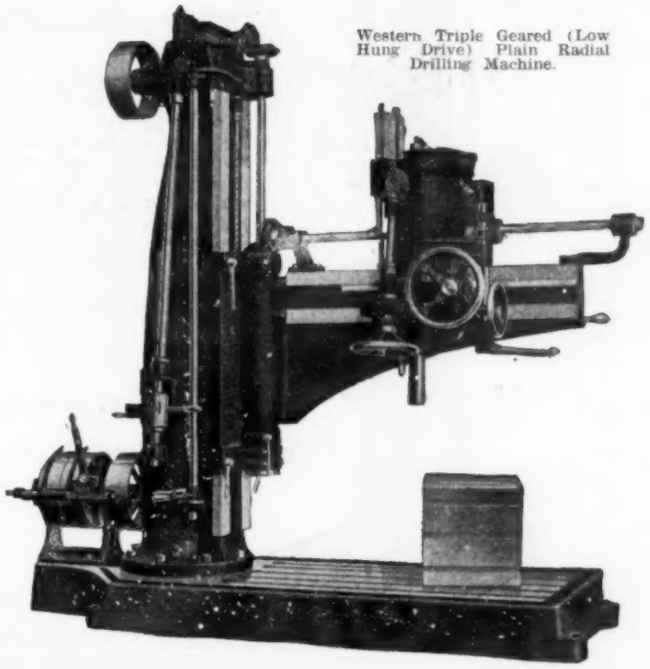


**THE CADILLAC TOOL COMPANY**
**Detroit, Mich.**

# What the User Says

## *of Western Radial Drills*

## Is Evidence of Their Superiority



Western Triple Geared (Low Hung Drive) Plain Radial Drilling Machine.

This is the kind of a drill that such concerns as the Packard Motor Car Co., Pittsburgh Valve, Foundry & Construction Co., Fairbanks, Morse & Co., Fore River Shipbuilding Co., and scores of others of equal prominence have adopted in their shops.

These manufacturers recognize the fact that the low-hung drive of Western Radial Drills gives them the most work for the power put into it.

They know that, in order to obtain the very maximum of returns for what they pay for, a machine should be built along practical—not theoretical—lines. Its design should be based on the actual needs of the *user*, not on what its manufacturer thinks it *should* be.

Western Radial Drills have developed themselves accordingly. Solid, substantial evidence of their worth is well expressed by those who have had them in operation for years.

Write to us for details, plans, specifications. It will be to your advantage to know what drills in general should be—and what Western Radials actually are.

**Western Machine Tool Works**

Established 1897

Holland, Michigan, U. S. A.

# For Hard Work

Boring, Drilling, Tapping, Facing—whenever it is a hard job on an awkward piece. You'll appreciate P & H ability.

The Pawling & Harnischfeger Horizontal offers not mere ability to get work done—but that added capacity which means getting it done right with accuracy, speed and economy. There are many reasons why you should know more of this machine.

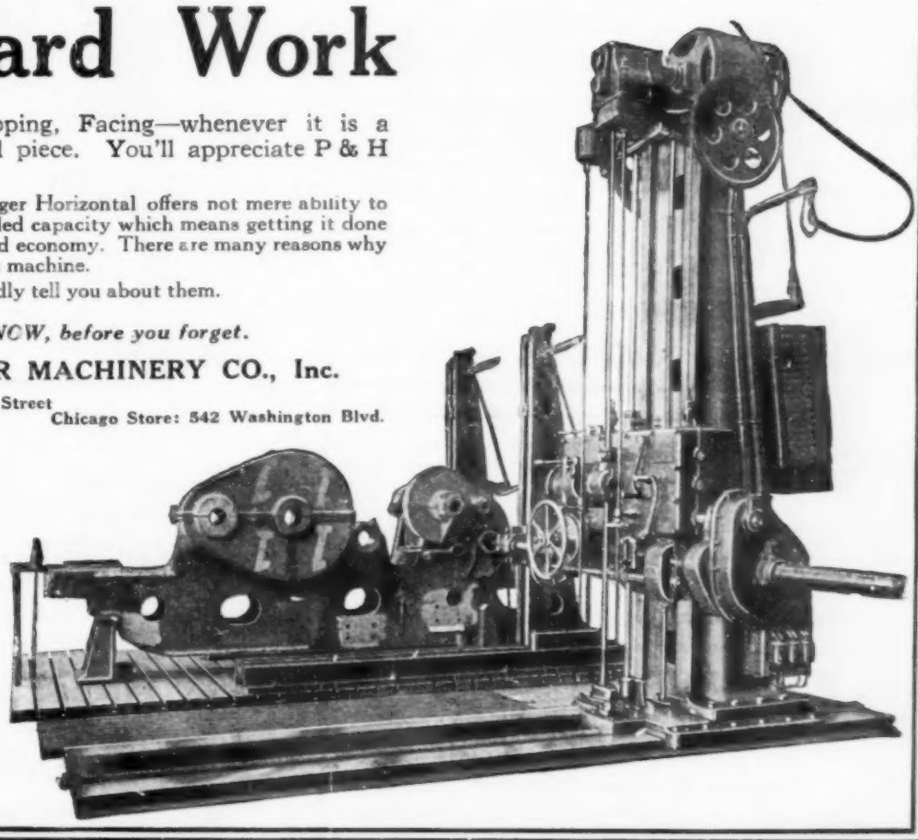
Drop us a line and we'll gladly tell you about them.

*Do it today, NOW, before you forget.*

**DALE-BREWSTER MACHINERY CO., Inc.**

New York Store: 55 Lafayette Street

Chicago Store: 542 Washington Blvd.



QUALITY P&H SERVICE

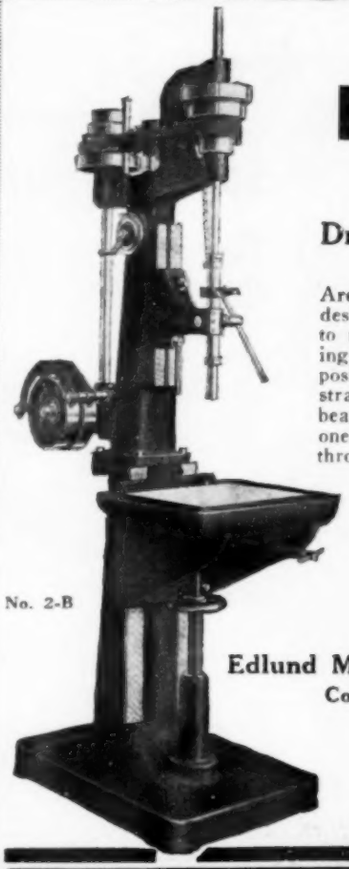
## Silver Time-Tested Drills

**Standard for Over a Half Century**

The cut shows our 25-in. Upright Drilling Machine, a sturdy tool that is built for the most generous output. It has the reliability that comes from long experience, with every practical improvement suggested by a constant study of modern shop requirements. We also make 20-in. Power Drills of "Silver" quality.

**Complete information upon request—20 or 25 in. or both**

**The Silver Mfg. Co.,** 360 Broadway **Salem, Ohio**



No. 2-B

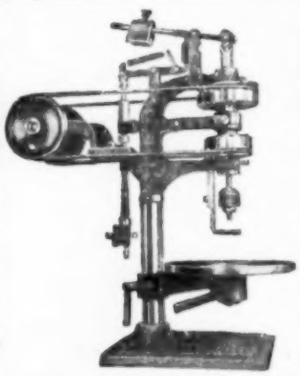
## The Edlund

### Open Type Drilling Machines

Are a combination of every desirable feature that goes to make up the ideal drilling machine. Quick change, positive drive, high speed, straight, endless belt, large bearing surfaces, frame in one piece, ball bearing throughout and construced in combinations of from one to six spindles are only a few of these features. Let us tell you them all.

***Write for Catalog***

**Edlund Machinery Co., Inc.**
Cortland, N. Y.
U. S. A.



## It's Hard To Break A Tap On The "Tuttle"

Tuttle Tapping Machines are serviceable tools for quantity productions of accurate work. Although sensitive machines they will stand the abuse of unskilled operation. "Tuttles" save taps and temper. Made in two styles: for hand lever and foot lever operation.

*Our Booklet gives details of both machines. Send for your copy now.*

**EVANS STAMPING & PLATING CO., Taunton, Mass.**

## Drill Presses That Run Absolutely True

**Sigourney Drilling Machines** are built with unequalled care and finish to do the highest grade of work. Where quality is required and an exact degree of accuracy necessary they are the most satisfactory drilling machines to use.

Made with one, two, three or four spindles. *Illustrated Catalog on request.*

**The Sigourney Tool Co.,**
Hartford, Conn.

## Highest Efficiency—Utmost Economy

"Hole Hog" Multiple Drillers and Borers increase the output and reduce production costs. Save in every direction. Increase the capacity of your plant by using "Hole Hogs" instead of building an addition. Tell us your needs.

**MOLINE TOOL COMPANY Moline, Illinois**

## HAMMOND HIGH-SPEED SENSITIVE RADIAL DRILLS

**For All Rapid, Accurate Work**

*Write today and find out how you can cut your light drilling and tapping costs from 25 to 50%*

**THE HAMMOND MFG. CO., Cleveland, Ohio**

## Drill Two Holes for the Cost of One

You can do it with a Nelson two-spindle adjustable drill head.

**Let us send you complete information.**

**Nelson-Blanck Mfg. Co.,** Clay and Dubois St., **Detroit, Mich.**

## The Mueller Machine Tool Company

**Cincinnati, Ohio**

**Radial Drills and Lathes**

**Write for particulars**

# 48 Holes Per Minute

No. 49 Drill, ¼ inch deep in brass. Two holes per piece.

Put this lightning fast drilling machine at work in your shop and equal or surpass this record. Single and multiple spindles. Shaft or motor drive.

Get Our Circular 502

**Leland-Gifford Co.**

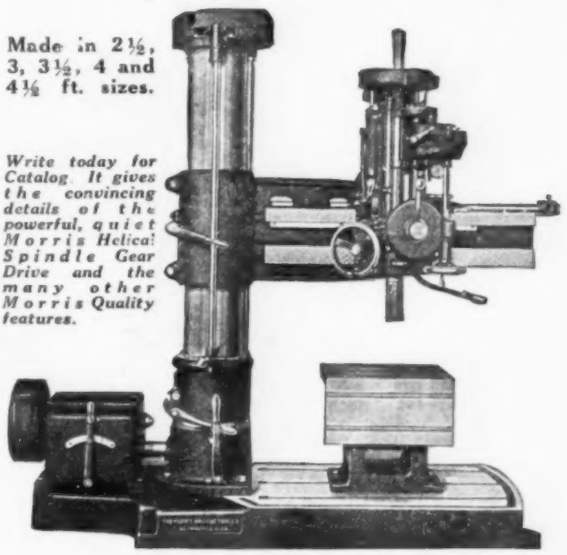
Worcester, Mass., U. S. A.

QUANTITY and QUALITY PRODUCERS

# MORRIS RADIALS

**Made in 2½, 3, 3½, 4 and 4½ ft. sizes.**

***Write today for Catalog. It gives the convincing details of the powerful, quiet Morris Helical Spindle Gear Drive and the many other Morris Quality features.***



**The Morris Machine Tool Company**

Cincinnati, Ohio

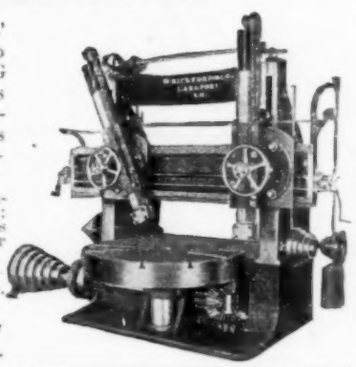
Niles, Bement, Pond Co., 111 Broadway, N. Y.

# The BICKFORD

is the creation of 27 years' exclusive devotion to VERTICAL BORING and TURNING. It has marvelous strength, rigidity and accuracy. Holds its original precision uniformly throughout.

Five sizes: 4 ft. to 8 ft. inclusive, one or two heads; rapid power traverse. Guides wide and true. Motor or belt driven.

Most interesting description in our catalog. **Write for one.**



**H. Bickford Company**

Lakeport, N. H., U. S. A.

**ITS A TRADE MARK SIPP**

**FEATURES**

**Quick Change Speed** Change in 2 seconds

**Most Efficient Drive** No belt troubles

**Safety First** All parts protected

**Heaviest Drill Made** Yet very sensitive

**All Ball Bearings**

**TURNING CORNERS IS PURE WASTE**

Every turn and twist in a belt impairs its life and efficiency. There is just one short, STRAIGHT endless belt on

**THE SIPP QUICK-CHANGE-SPEED DRILL**

therefore it is as plain as daylight that you get the most efficient drive with the least wear. Why waste power and leather when a SIPP DRILL would save them for you?

**Write for Details**

# THE SIPP MACHINE CO.

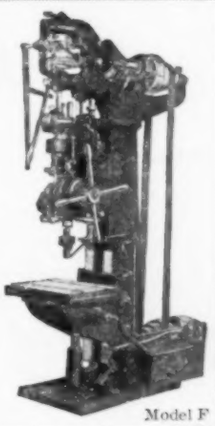
Erie R.R. Ave., Patterson, N. J.

## Accuracy, Versatility and Cost Reduction

are strong factors of profits in the

# TURNER TURRET

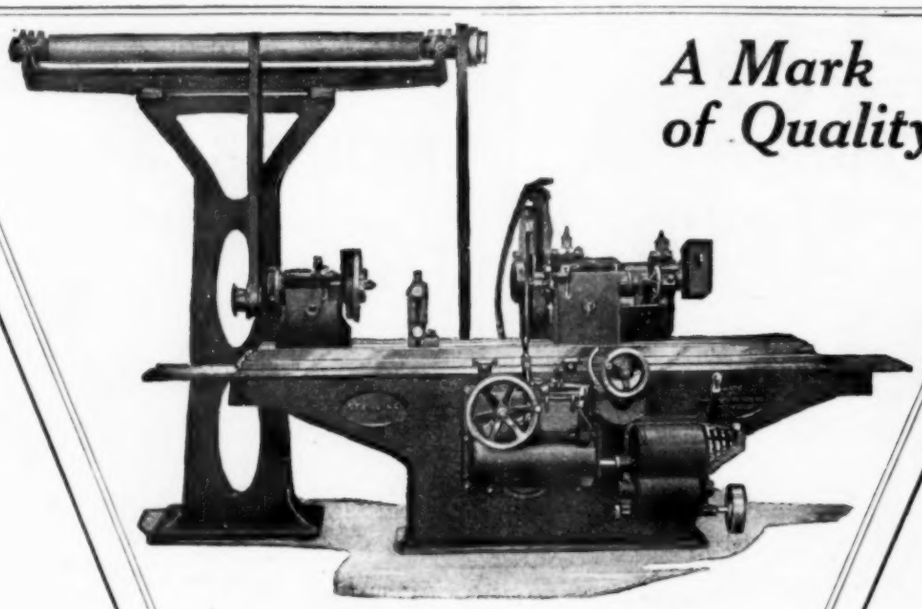
Reduces costs because it jumps production of duplicate parts an average of 50 per cent. — combines accuracy and versatility of a high-class turret lathe with speed and power of a heavy duty drill press. **Write for Bulletin "AM."**



Model F

**TURNER MACHINE COMPANY**

Danbury, Conn., U. S. A.



## *A Mark of Quality*

## Look for it on a
# Cylinder Grinder

The speed and accuracy with which Sterling Cylindrical Grinders operate will be appreciated where a higher production of higher class work is the aim. Rough and closely turned parts are handled with equal efficiency. Accurate results in cam shaft and crank shaft grinding are assured. Sterling Grinders are permanently guaranteed.

***Sterling Grinders are equipped with Sterling Grinding Wheels.***

**Sizes:**
**18 in. x 50 in.**
**18 in. x 60 in.**
**18 in. x 72 in.**

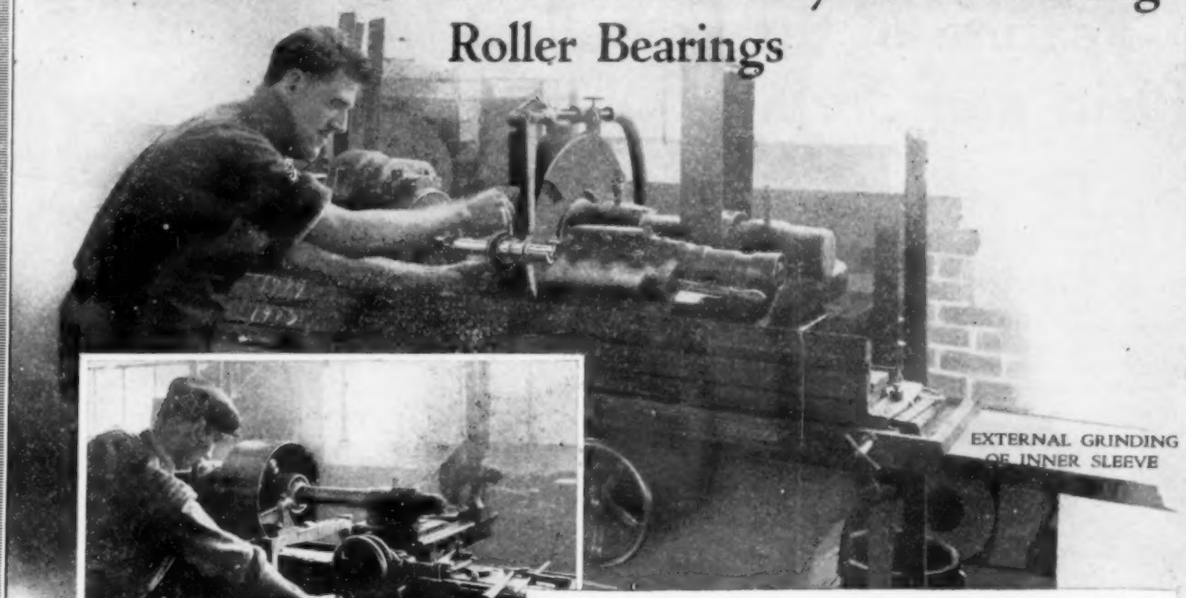
***Send for our new Illustrated Catalog***

## McDONOUGH MFG. CO.
**EAU CLAIRE, WIS., U. S. A.**
**MACHINE TOOL DEPARTMENT**

AGENTS:
Young, Corley & Dolan, Inc., 115 Broadway, New York City. New York District The Luster Machinery Company.
Patterson Tool and Supply Co., 123-125 East Third St., Dayton, O. Southwestern Ohio Distributors.
Wm. C. Johnson & Sons Machinery Co., St. Louis, Mo.
Cadillac Tool Co., Detroit, Mich.
Homer Strong, Rochester, N. Y.
F. E. Satterlee, Minneapolis, Minn., Northern Wisconsin and Minnesota Distributors.
J. S. Miller Machinery Co., 3 Wood St., Pittsburgh, Pa.

STERLING

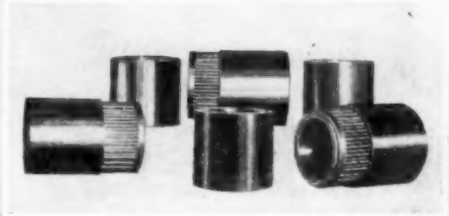
# The Part that Aloxite Wheels Play in the Making Roller Bearings



EXTERNAL GRINDING OF INNER SLEEVE

INTERNAL GRINDING OUTER SLEEVE

GRINDING ROLLS



THE FINISHED BEARINGS

THERE are not many precision grinding conditions that put a grinding wheel through such a test as Aloxite Wheels are subjected to in the grinding of roller bearings.

Aloxite Wheels do all of the important grinding jobs —the internal and external grinding of inner and outer sleeves and the grinding of the rolls.

Each job calls for a wheel that must cut clean and fast and cool—a wheel that must hold its shape, and keep free to insure accuracy.

The sleeves are generally of cold-drawn steel, case-hardened. Certain of these sleeve dimensions are held to a total tolerance of .0002″.

The rolls as illustrated are of special carbon-chrome analysis, and, after hardening, are ground to a minus tolerance of .0005″. No plus tolerance allowed.

## Aloxite Grinding Wheels are Performing all of these Operations

**They not only meet the exacting conditions, but have increased the grinding production in one plant, 25%.**

Carborundum service and a close study of grinding conditions enables us to give

*The Right Wheel in the Right Place*

Carborundum service is your service

## THE CARBORUNDUM COMPANY, NIAGARA FALLS, N. Y.

NEW YORK CHICAGO BOSTON PHILADELPHIA CLEVELAND CINCINNATI
PITTSBURGH MILWAUKEE GRAND RAPIDS

# Convenient Operation Is a Feature of the La Salle Plain and Surface Grinder

In just the same manner as a new attachment is featured upon any machine, we have brought foremost upon the LaSalle No. 1 Plain and Surface Grinder, as a principle of design, an ease of operation which, we daresay, has been as yet unsurpassed.

The simple construction of this machine is very evident in the accompanying photograph. We have, in designing it, brought out and emphasized only those parts which are essential to quick, rapid execution of general shop and tool room work. Aside from this, there are no superfluous parts to get out of order, cause annoyance, or demand unusual skill in operation.

Many manufacturers have found the La Salle No. 1 Plain and Surface Grinder an invaluable asset to their tool room. If it has been a saving of time and money to others, surely it will do the same for you.

***We are anxious to send you some descriptive literature on La Salle Grinders. May we do so?***

**La Salle No. 1 Plain and Surface Grinders**

## La Salle Tool Company

**La Salle, Ill., U. S. A.**

# SUPERIOR

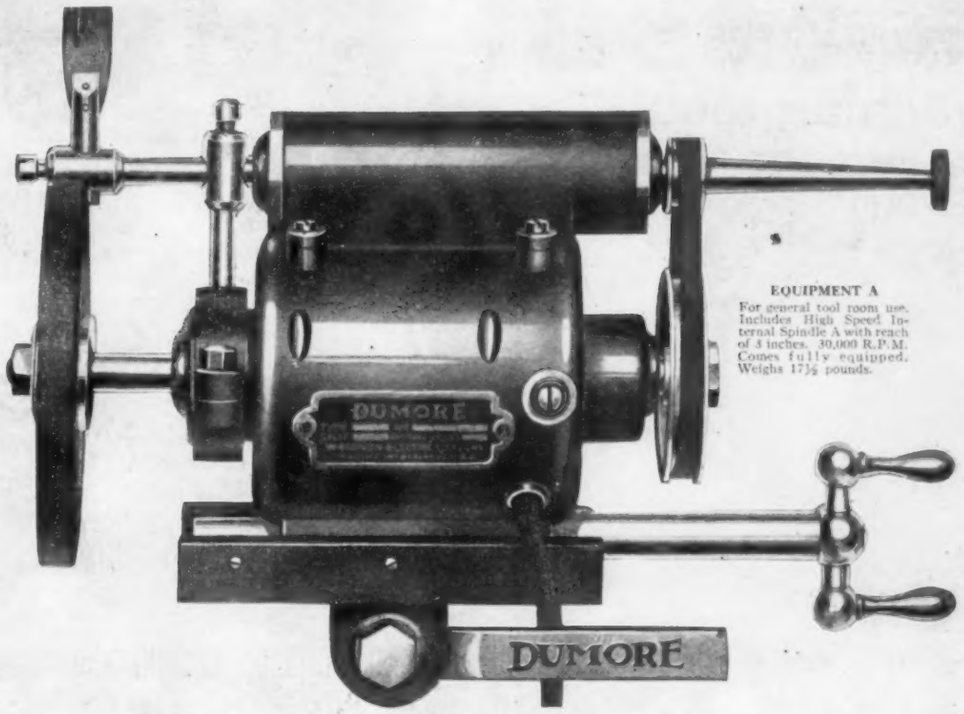
# GRINDING WHEELS

Look over the better grades of grinding wheels and we feel certain that after an exacting comparison you will select Superior Corundum Wheels to meet all future needs.

These wheels have been made for 30 years by three processes, Vitrified, Silicate and Elastic and from either natural or artificial abrasives.

***Send us that trial order today.***

**SUPERIOR CORUNDUM WHEEL CO., Waltham, Mass., U. S. A.**



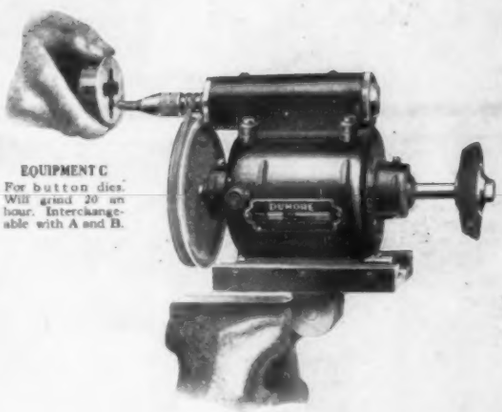

**EQUIPMENT A**
For general tool room use. Includes High Speed Internal Spindle A with reach of 3 inches. 30,000 R.P.M. Comes fully equipped. Weighs 17½ pounds.

THE vital need felt in all tool-rooms and repair shops for a portable grinder that will give absolutely accurate results is answered by the **DUMORE**

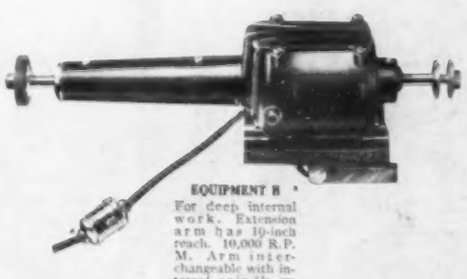
Here is a tool of many uses—one which reduces operating costs and gives a very high standard of efficiency. Perfect running balance combined with speeds ranging from 10,000 to 50,000 R. P. M. give the **DUMORE** domination of the portable grinding field.

Write for complete information.

WISCONSIN ELECTRIC CO.
2715 16th Street RACINE, WIS.



**EQUIPMENT C**
For button dies. Will grind 20 an hour. Interchangeable with A and B.



**EQUIPMENT B**
For deep internal work. Extension arm has 10-inch reach. 10,000 R.P.M. Arm interchangeable with internal spindle on Equipment A.

# DUMORE HIGH SPEED GRINDERS

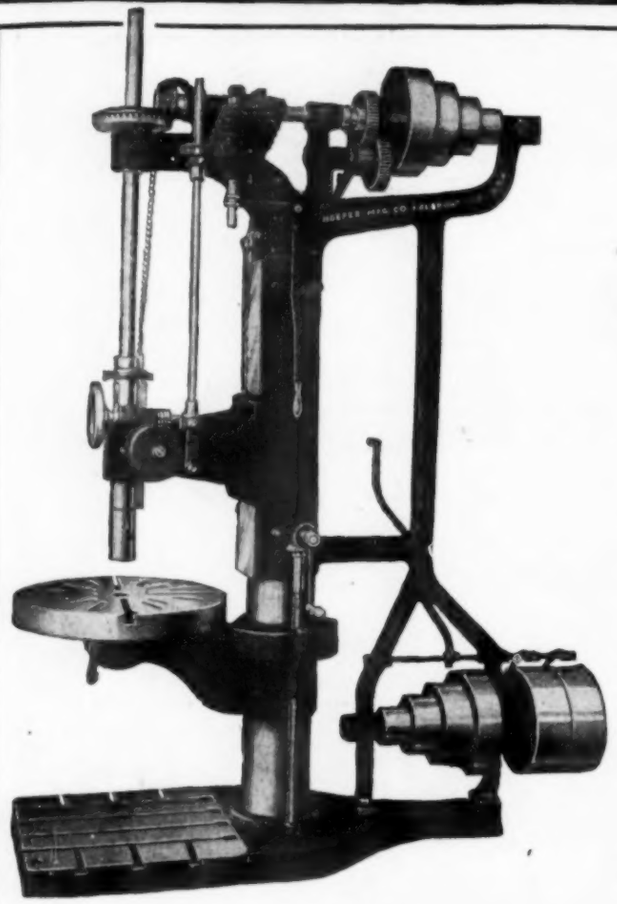
# Will grind any machine tool

**The Oakley No 2 Universal Cutter and Tool Grinder** with attachments will grind rapidly and accurately to a cutting edge any tool that comes to the tool room. Milling Cutters, Jig Bushes, Straight Edges, Snap Gages, Slitting Knives, Reamers, Rose Bits, Formed tools are all handled with equal facility on this machine. Unusually rigid construction and simplicity of operation make it an accurate and rapid surface, cylindrical and internal grinder.

Your tools and your work will benefit by your investigation of this machine. *Write today for catalog which gives all details.*

**The Oakley Machine Tool Co.**
**Cincinnati, U. S. A.**

# The OAKLEY NO. 2



## *The Driller for Exact Work*

***Enables Your Workmen to Eliminate Spoilage***

# HOEFER

The Hoefer Driller is pre-eminently the one to be found in the *best* plants. "It's almost as good as a Hoefer," so often heard in the machine and tool trade, indicates the position held by Hoefer Drillers.

Exact drilling, to the last thousandth of an inch, pays by eliminating spoiled material. Hoefer Drillers pay for themselves and increase the workman's pride in his work.

## Twenty-five Years on Market

Twenty-five years making drillers has given Hoefer the "Know-how." The Hoefer Drillers are used by many of America's leading manufacturers. Equip your factory the Hoefer way.

Take any kind of a drilling problem you have to the Hoefer Manufacturing Company and the Company's experts can tell you how it was solved by other men, some of whom you may know.

Investigate now. Write today for catalog. The Hoefer engineers are at your service.

**HOEFER MFG. CO., Freeport, Ills.**

# new ideas

Many new ideas are included in the design of this original Bore Grinder.

To begin with, the machine is entirely self-contained.

The drive can be either from the line shaft or through a jack shaft.

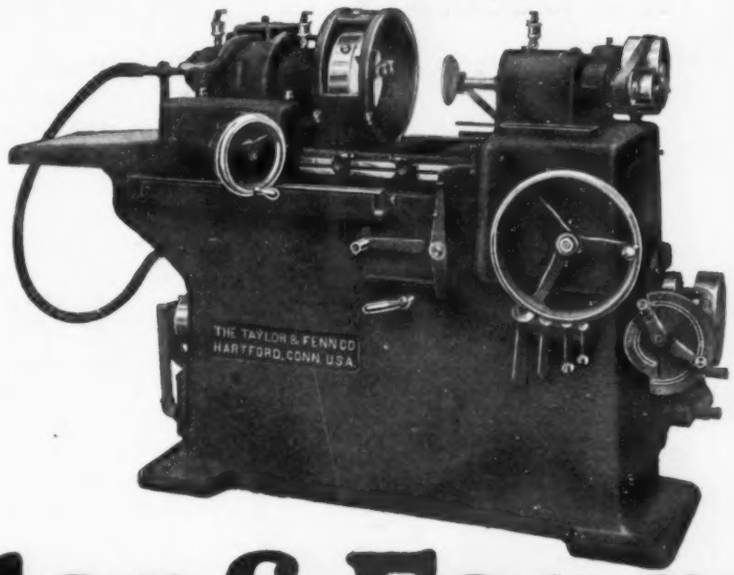
The wheel spindle and spindle drive have a solid stationary support which is practically part of the base proper.

Cross feed and longitudinal movement are on V and flat ways underneath the work head.

Table reverse is noiseless and no shock is felt when reverse takes place.

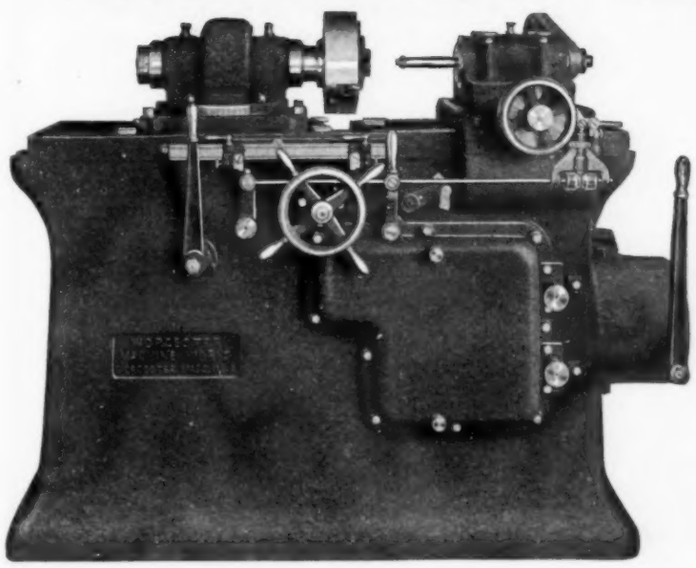
Vibration in all parts is eliminated and speed with the greatest possible accuracy in grinding is assured.

There are many other new features. All are described in our circular. Write for one today.




## The Taylor & Fenn Company
Hartford Conn. U.S.A

# differences



Originality is the keynote in the design of this new internal grinder and the results of this originality are vibrationless grinding.

The work head rather than the spindle head is caused to move longitudinally thus taking away a chance for vibration in the spindle.

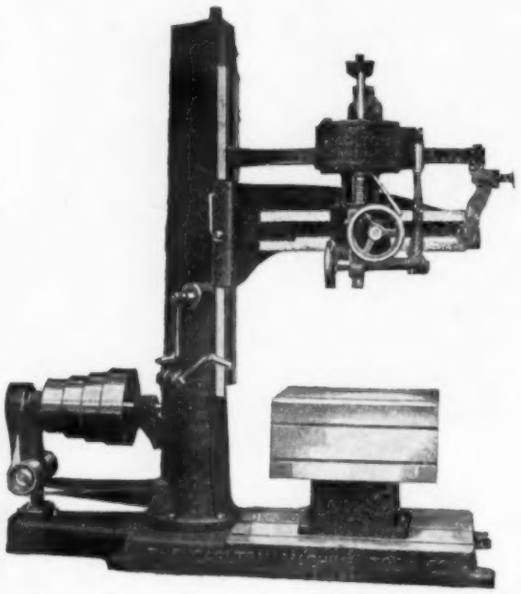
The only movement of the spindle head is crosswise. The cross side plate is mounted on a bridge by suitable ways and gibs, the bridge being bolted securely to the base. A special point is made in drawing the bridge down to the base by these bolts, making the two parts as nearly one casting as possible.

This arrangement gives a solid, massive foundation for the spindle-head and thus also greatly reduces the chance of vibration.

There are other features that are well worth any man's attention. Our bulletin describes this new machine fully. *Shall we send you a copy?*

## Worcester Machine Works, Inc.
Worcester, Mass., U. S. A.

# Drills a $\frac{5}{8}$-in. Hole Through 2 in. of Cast Iron In 5 Seconds



These Speedy, Belted Sensitive Radial Drills can be depended on to give the maximum in results and satisfaction. So fast that we don't equip them with power feed. Five seconds puts a $\frac{5}{8}$-in. hole through 2 inches of cast iron. Guaranteed to drill holes up to 1-in. cast iron or $\frac{3}{4}$-in. steel. Taps $\frac{5}{8}$-in. cast iron or $\frac{1}{2}$-in. steel.

Heavy, rigid design, bronze-bushed spindle, tapping attachment with instantaneous reverse, positive and noiseless, and all-belt drive, countershafts have Hyatt-Roller Bearing and have two speeds, are features which warrant their continued use in the progressive shops of the country.

Will be glad to have careful buyers take up with us these merits in detail *Write today!*

**The Carlton Machine Tool Company, Cincinnati, Ohio**

# Cheaper Ground Parts

If your work falls within the range of the Ott 5 in. x 18 in. Plain Grinder you can finish them to the closest limits at lower unit cost than on any other grinder of the same capacity that we know of. It is a simple tool to operate, hence operators of average experience can be used.

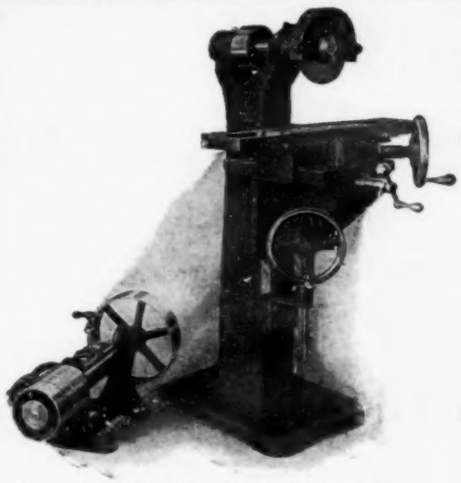
The wheel has a large surplus of power and heavy roughing cuts can be taken. It has ample range of work and table speeds.

The initial investment, maintenance, depreciation and interest charges are lower than on other grinders of similar rated capacity.

It will pay you to investigate thoroughly the Ott 5 in. x 18 in. Plain Grinder if you are interested in lower unit production.

**Ott Grinder Co., 230 W. Tenth St., Indianapolis Ind.**

REPRESENTATIVES: McMullen Machinery & Supply Co., Grand Rapids, Mich.; Marshall & Huschart Machinery Co., Indianapolis, Ind.; Ogden R. Adams, Rochester, N. Y.; Cadillac Tool Co., Detroit, Mich.; Cleveland Tool & Supply Co., Cleveland, Ohio; Coghlin Machinery & Supply Co., Toledo, Ohio; Machine Tool Engineering Co., New York, N. Y.; Brown & Zortman Machinery Co., Pittsburgh, Pa.; Syracuse Supply Co., Syracuse, N. Y.; Dale-Brewster Machinery Co., Chicago, Ill.; Concord-Wright Machinery & Supply Co., St. Louis, Mo.; Swind Machinery Co., Philadelphia, Pa.; L. S. DeVos, Export Representative, New York, N. Y.; Selson Engineering Co., England, France and Italy.



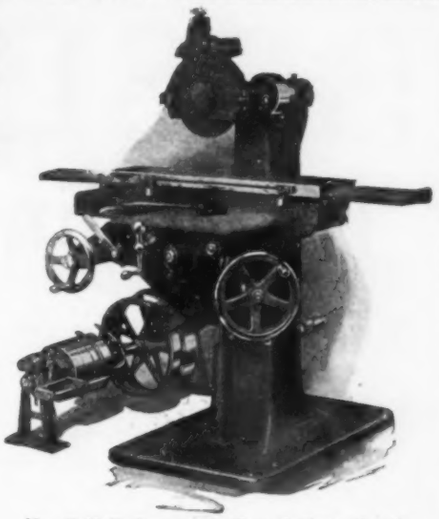
No. 1 Hand Feed Surface Grinder without the Drill Grinding Attachment
High grade ball bearings and accurate design make rapidity and accuracy certain.

# W & M GRINDERS

In Nearly
100 Styles

Illustrated
In Catalog
No. 1001

It is
Free on Request.



No. 2 Full Automatic Dry Surface Grinder
Capacity, 8¼ x 20-in. Surfaces
Note how carefully bearings are protected from grit and dirt.

## WILMARTH & MORMAN COMPANY

*Master Grinder Makers*

1187 Monroe Ave., N. W. Grand Rapids, Mich., U.S.A.

Manufacturers of Drill Grinders

Surface Grinders Universal Grinders

# WHITNEY CYLINDER GRINDER

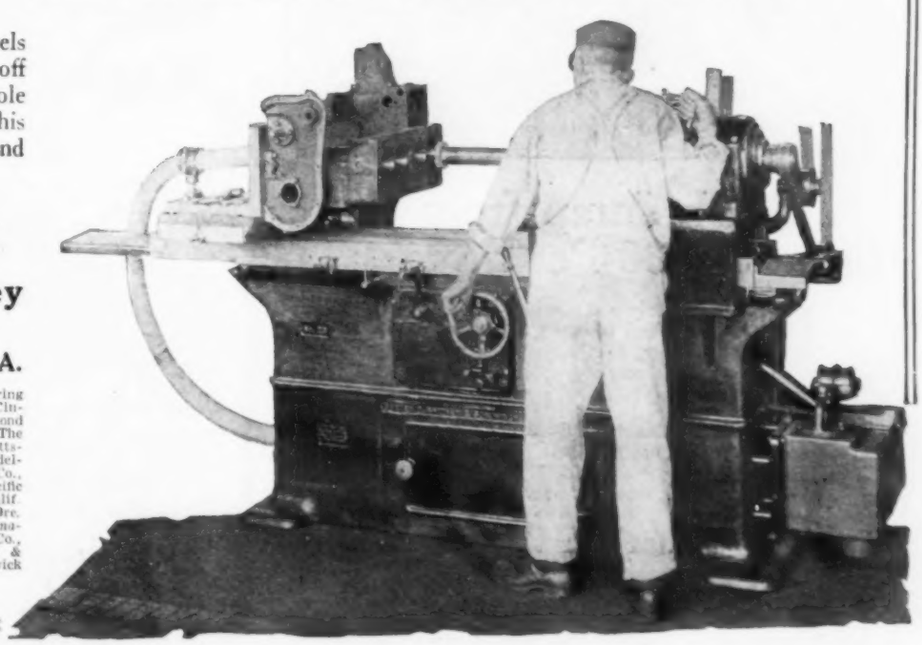
FOR GRINDING ALL KINDS OF GASOLINE ENGINE CYLINDERS AS WELL AS WORK TOO LARGE OR TOO HEAVY TO REVOLVE

The grinding wheel travels in a true circle and grinds off only enough to make a hole that is round and straight. This machine does the work right and does it quick.

*Write for new catalog*

**Baxter D. Whitney & Son, Inc.**
**Winchendon, Mass., U.S.A.**

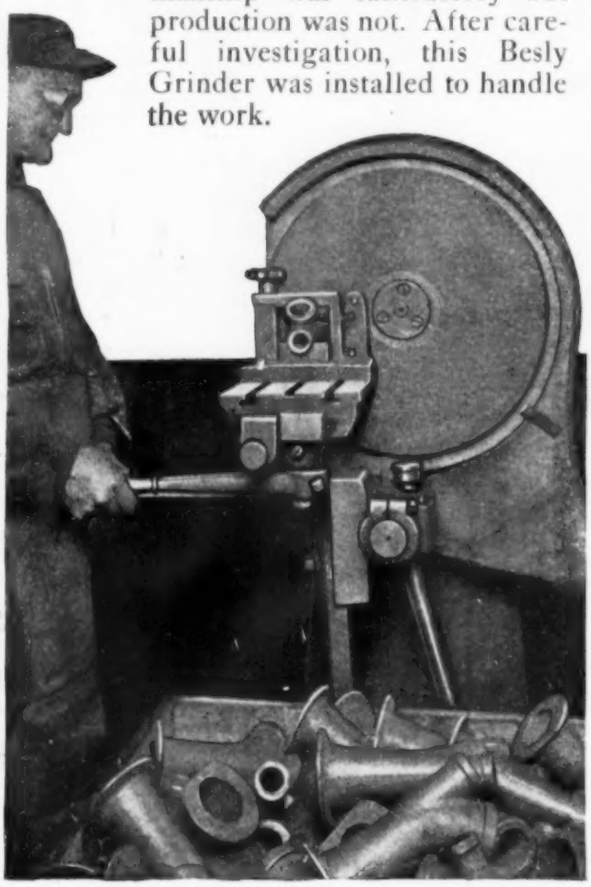
*Domestic Agents:* Machine Tool Engineering Co., New York City. E. A. Kinsey Co., Cincinnati, Ohio. Strong, Carlisle & Hammond Co., Cleveland, Ohio and Detroit, Mich. The Motch & Merryweather Machinery Co., Pittsburgh, Pa. Sherritt & Stoer Co., Philadelphia, Pa. Carey Machinery & Supply Co., Baltimore, Md. *Pacific Coast Agents:* Pacific Tool & Supply Co., San Francisco, Calif. Portland Machinery Co., Portland, Ore. Perine Machinery Co., Seattle, Wash. *Canadian Agents:* Canadian Fairbanks-Morse Co., Montreal, P. Q. *Foreign Agents:* Buck & Hickman, Ltd., London, England. Fenwick Freres Co., Paris, France.



# BESLY
## Grinding

**For Dort Motor Car Co.**

Up to two years ago, the bases of gasoline inlets for "Dort" motors were finished on a milling machine. Quality of workmanship was satisfactory but production was not. After careful investigation, this Besly Grinder was installed to handle the work.



## A Quick Jump from 200 to 600 Per Day

was secured immediately and finish is just as satisfactory. Initial investment is the small part of the cost of a milling machine; but operating the Besly requires no skill and is accomplished with much simpler and less expensive fixtures than milling.

Last but not least, this "Besly" has not cost a cent for repairs since it was put to work. Besly Grinding is far reaching in its application and will be a profitable practice to introduce into your shop. Let us show you.

BESLY CHICAGO

**Charles H. Besly & Co.**
124 N. Clinton St.
Chicago, Ill., U. S. A.

# Standard Equipment

The name STANDARD is not without significance. The Diamond Floor Grinders of this type have been adopted as standard equipment in the shops of many well-known organizations. They are adopted as standard not only because of their attractive design but because they are sufficiently heavy with weight properly distributed to reduce vibration to a minimum.

The Diamond Standard Grinder is built by the manufacturers of the Diamond Heavy Face Grinder, the Diamond Automatic Surface Grinder, the Diamond Wet Tool Grinder and the Diamond Disc Grinder.

*Literature covering all or any of these lines sent on request.*

**DIAMOND MACHINE COMPANY**
Providence, R. I., U. S. A.

# They Never Burn the Work

If you select the proper grain and grade of Vitrified Wheel you will never burn the metal being ground. They are porous, consequently cool cutting, and this porosity further prevents gumming and glazing.

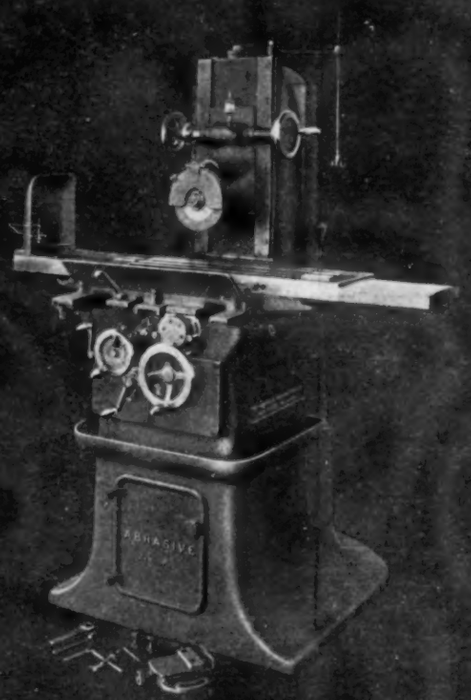
## Vitrified Wheels

run equally well wet or dry. Oily or acidulous conditions have not the slightest effect on them. There is not a metal made a Vitrified Wheel will not cut and we make them in grains and grades to suit every grinding need.

***Send in for our circulars and note the completeness of our line.***

**The Vitrified Wheel Company**
Westfield, Mass.

# ABRASIVE Surface Grinders



## Strength

The "Abrasive" is the strongest, most rigid tool room surface grinder. It is over 50% heavier than any other similar machine; its metal is so disposed as to practically eliminate all vibration. The frame is a **One Piece Casting** resting on 3 points. This insures maximum resistance, minimum of stress and strain and the retention of the original, accurate alignment.

Built on the Unit system throughout, any unit can be removed without materially disturbing any other part.

**Ask Us to Send You Specifications.**

THE ABRASIVE MACHINE TOOL CO.
PROVIDENCE, R.I. U.S.A.

# "WAUSITE"

**REG. U. S. PATENT OFFICE**

The **fast cutting "WAUSITE"** Abrasive Cloth is put up in the handy waste proof roll.

Just pull out the required length of the handy width strip, cut off and use. No folding — **no waste — easy to use.**

**Write us today for details, working samples, and prices on "WAUSITE"**

**WAUSAU ABRASIVES CO.**
**118 S. Clinton St., Chicago**

# Let Your stock boy grind your drills

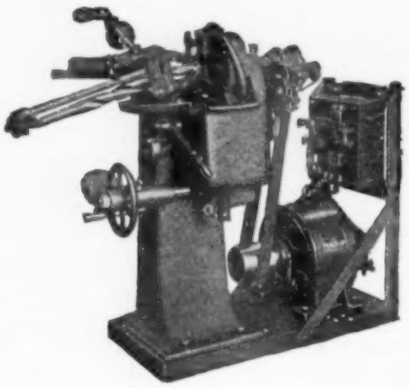
Don't have a high salaried mechanic waste his time that way when it is not necessary. With the

## Grand Rapids, Double Holder Double Duty, Drill Grinder

your stock boy can keep your drills sharpened better than an expert mechanic can sharpen them by hand. The machine mechanically insures them being correctly ground and with the removal of a minimum of stock from the drill. And it is fool-proof.

***Write for our catalog full of convincing details.***

**Grand Rapids Grinding Machine Co.**
**33 Ottawa Avenue, N. W.**
**Grand Rapids**
**Michigan, U. S. A.**



# William Sellers & Co. Incorp.

*Philadelphia, Pa.*

**The Sellers' Drill Grinder**

Improve your drills and increase their output by having them correctly ground and pointed by this machine. Grinds proper amount of clearance to every part of cutting edge. Insures exact similarity of cutting edges. Drills so sharpened do more work, cut faster and feed easier than when sharpened in any other way. Capacity ¼ in. to 3 in., inclusive.

**Better Drills** **More Holes**

**Labor-Saving Machine Tools** **Shafting** **Injectors**

## Exceptional Rigidity for Accurate Grinding

The improved design of Draper & Hall Surface Grinders provides exceptional rigidity to the working table and enables the operator to obtain a remarkable degree of accuracy on the most intricate work.

Equipped with hand or power feed.

**Write for full details.**

**The Draper & Hall Company**
**Middletown, Conn.**

## Greenfield

Trade Mark
Reg. U. S. Pat. Off.

A universal grinder. A grinder with all attachments. A grinder that will handle all kinds of tool-sharpening as well as cylindrical, internal and surface grinding.

An all-around machine for your tool-room.

**Catalog No. 6.**

**Greenfield Machine Co.**
**Greenfield, Mass., U. S. A.**

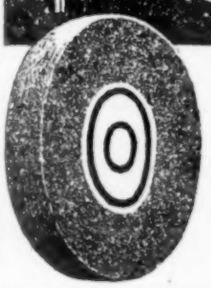
## The Diamo-Carbo Dresser

Large shops are now using this tool in place of the expensive black diamond.
Dresser consists of a steel tube filled with an abrasive of such intense hardness that it will cut and dress any grinding wheel except the "hard" grade or the extremely coarse and large wheels for grinding castings. Ask for one on trial.

**No. 1—8 in. long, $3.00. No. 3—10 in. long, $3.50. No. 5—12 in. long, $4.00. Bulletin on request.**

**Desmond-Stephan Mfg. Co., Urbana, O.**

The Canadian Desmond-Stephan Mfg. Co., Ltd., Hamilton, Ont., Distributors for Canada. Alfred Herbert, Ltd., Coventry, Agents for Great Britain.



## HAMPDEN
**Grinding Wheels**

**A Wheel For Every Purpose**

**Hampden Corundum Wheel Co.**
Springfield, Mass

## "FULFLO"

—the brief way to specify *the* Troubleproof Lubricant Pump. Thousands have been convinced by test. Let us show you. Easily attached to any machine in your shop.

**The Fulfo Pump Co., Blanchester, O., U. S. A.**

## CULLMAN
**Sprockets and Chains**

In stock and to order. Send for Catalogue.

**CULLMAN WHEEL COMPANY**
1349 Altgeld St., CHICAGO, ILL.

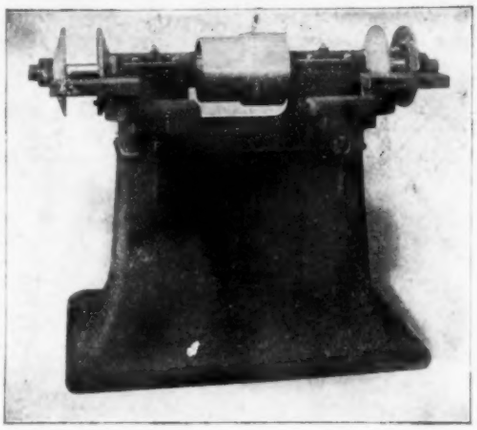
## CINCINNATI GRINDING MACHINES

Plain Cylindrical
Manufacturing Internals
Crankshaft

Manufacturing Universals, Worm Grinding
Cam

**THE CINCINNATI GRINDER COMPANY**
3233 COLERAIN AVE., CINCINNATI, O.

# FOR FOUNDRY WORK

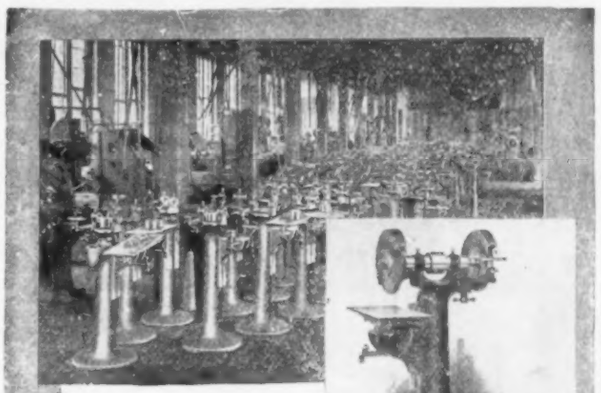


## *Blount Heavy Grinder*

It does the rough drudgery. Built for hard service. Bearers are self-oiling, babbitted and line reamed. Liners placed between the caps and boxes prevent dust entering the bearings and allow adjustment for wear. Our lathes and wet grinders also merit attention.

***Write now for Catalog.***

**J. G. BLOUNT COMPANY**
**Woodland Street, Everett, Mass., U. S. A.**



## *We Build Them By Hundreds*

And so we can sell a superior machine at a moderate price without sacrificing any of the advantages of the more costly machines.

**THE WATERBURY GRINDER**
grinds rapidly and accurately, all flat surfaces, dies, punches, planer, lathe and other tools. Has adjustable table and tool rest with large radius of travel. Rigid, 3-point table supports giving great steadiness. A reliable, practical grinding outfit.

**The Blake & Johnson Co., Waterbury, Conn.**

# Precision in Grinders

is exemplified in this No. 2 Universal Tool and Cutter Grinder which is designed to meet the requirements of modern tool room grinding.

**Woods' Universal Grinder**

is strictly universal — changes from one operation to another made quickly and easily. Will grind any cutter, reamer or other work within its range accurately and quickly.

*Allow us to send you full particulars.*

**The Woods Engineering Co.**
**Alliance, Ohio**

# The SYRACUSE Disc Sander Is 90% Dustless

Think what a godsend that is to the pattern shop. Hundreds of prominent concerns, including the U. S. Navy Yards, are profiting immensely by using Syracuse Sanders.

Two types of Syracuse Sanders are built—the Disc Sander, shown here, and the Oscillating Spindle Sander. Both machines are equipped with New Departure ball bearings and General Electric motor. The table in each case can be tilted by a hand adjustment, 45 degrees down or 15 degrees up. Power is obtained by plugging into a lamp socket.

Syracuse Sanders are extraordinarily well built and are guaranteed against all defects.

***Ask for Bulletin and prices***

**Syracuse Sander Mfg. Co., Inc.**
**Syracuse, N. Y.**

# Grinders and Grinding Appliances

Assure perfect results at low cost and with features of insurance to the operator.

These features are built in many of the machines and are not merely an extra item to pay for.

*Get a line on our line by the big catalog. Write for your copy.*

**Safety Emery Wheel Company**
**Larch St., Springfield, Ohio**

# THE "RACINE"
## HIGH SPEED METAL CUTTING MACHINE

# IT'S ALL IN THE POSITIVE LIFT

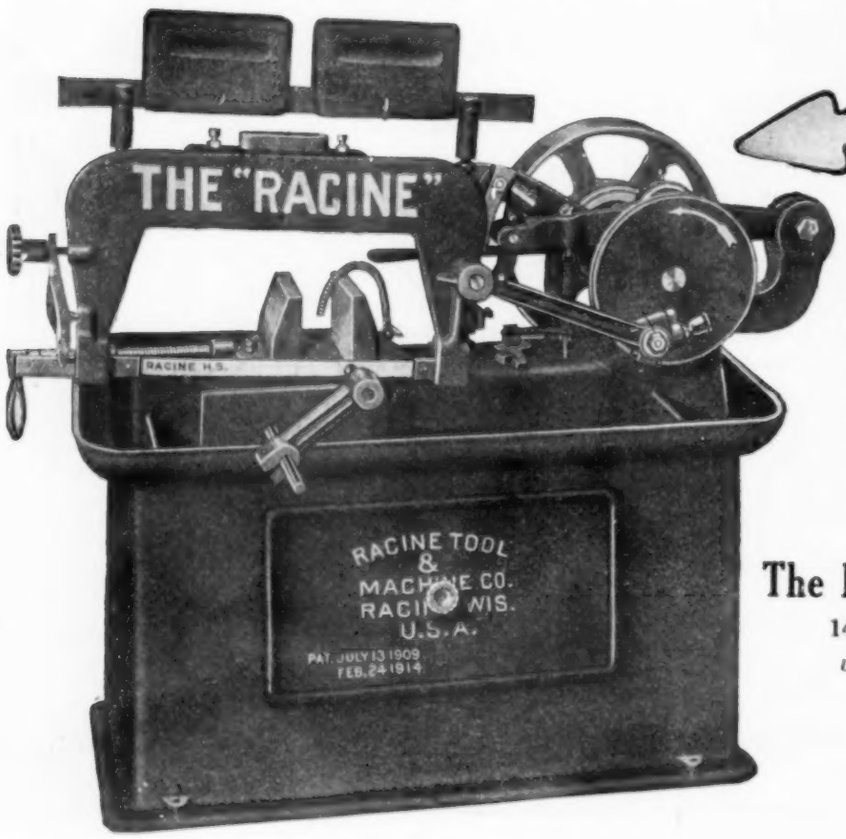
Saw blades are designed to cut on one stroke only, and on that stroke—the cutting stroke—it is important that the blade be firmly held, and lowered with even pressure to the work.

Every time the teeth come in contact with the work, they cut a little deeper *provided*—that they are moving in the right direction. When they move in the *wrong* direction across the work, you gain nothing; the friction caused only serves to wear out the blades.

Ever think of that?

The chief item of expense on most metal cutting machines is the necessity of constantly renewing the blades.

"Standard the World Over"




Now then, isn't it perfectly apparent to you that the *less friction* the blade is subjected to, the longer it will wear?

Then if a blade comes in contact with the metal *on the cutting stroke only*, it is obvious that its life should be practically twice as long as one which is constantly being drawn back and forth, on *both* strokes.

THE "RACINE" High-Speed Metal Cutting Machine is the *only machine on the market which positively lifts the blade free and clear of the work on each and every non-cutting stroke.*

Write to us and we will send you some interesting facts on production.

**The Racine Tool & Machine Co.**
1400 Jones Avenue, Racine, Wis.
*Use Racine H. S. Tungsten Power Blades*

# ATKINS *NON-BREAKABLE* *HACK SAW* BLADES

## Won't Break!

ATKINS "AAA" Non-Breakable Hack Saw Blades are manufactured expressly for the toughest, roughest and most inaccessible work. Their special temper and superior material assure you of the highest cutting efficiency on every job. The teeth are milled and set to give at least 50% more cutting service.

It goes without saying that Atkins "AAA" Non-Breakable Hack Saw Blades will out-wear and out-cut any "All-Hard" blade in the world. Users find that they are economical because they will not snap. Get Atkins Hack Saw Chart. It lists the correct blade for every use.

WRITE FOR DESCRIPTIVE LITERATURE ON
**Atkins KWIK-KUT and Metal Band Saw Machines, Circular Metal Saws, Etc.**

## E. C. ATKINS & CO., INC.

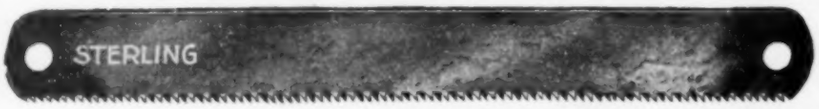
Established 1857 *Home Office and Factory,* INDIANAPOLIS, IND.

*Canadian Factory,* HAMILTON, ONT. *Machine Knife Factory,* LANCASTER, N. Y.

BRANCHES CARRYING COMPLETE STOCKS IN ALL LARGE DISTRIBUTING CENTERS AS FOLLOWS:

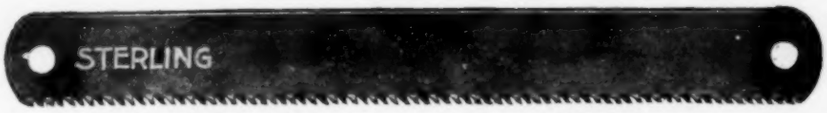
| | | | | | |
|---|---|---|---|---|---|
| Chicago | Memphis | New Orleans | Portland, Ore. | Seattle | Sydney, N. S. W. |
| Atlanta | Minneapolis | New York City | San Francisco | Vancouver, B. C. | Paris, France |

# "STERLING" Hack Saw Blades




Guarantee satisfaction. A trial will convince you of their superiority.

Insist on securing the "Sterling" Brand




MANUFACTURED BY

Diamond Saw & Stamping Works, Buffalo, N. Y., U. S. A.

---

Would you like to have us prove that

**Peerless** HIGH SPEED

Machines do 50 to 100% more work?

The Peerless has established a new standard of production in so many plants that we are ready to ship one at our expense and risk, if you agree to give it a thorough test. A trial like this often results in our selling from 1 to 10 machines.

**The Balanced Lift of the Peerless**

automatically raises the blade for the return stroke. This greatly prolongs the life of the blades, economizes power, and increases production. There are more good features which we shall be glad to acquaint you with.

***The Peerless assures you the peak of production at very lowest cost. Write for full details.***

**PEERLESS MACHINE COMPANY**

1615 Racine Street, Racine, Wisconsin

---

The

# HIGLEY

## Cold Metal Saw

*Catalog will be sent on application to*

**Vandyck Churchill Company**

93 Liberty Street, New York

---

No. 3

## For Tool Room or Shop

You will be able to find considerable work for a Hercules Shear and Rod Cutter no matter in what part of your plant you may place one. In the tool room on experimental work, in the stock room for cutting rods off in short lengths, out in the shop cutting pieces to save the carting of long lengths to the cutting-off machines; there are any number of ways a Hercules will save you.

Why not write us today and let us tell you more about it?

**W. A. & C. F. Tucker**

Hartford, Conn.

---

# VICTOR HACK SAWS

*Get a box and try 'em.*

VICTOR SAW WORKS

SPRINGFIELD, MASS., U.S.A.

---

## Hunter Saws—Any Size, Any Style

What are your saw requirements?

*Let us furnish estimates. Write.*

We manufacture—

**Hot Saws, Friction Discs, Solid Blades made of Vanadium, Tungsten and Chrome Alloy Steels. Saw Sharpening Machines. Inserted Tooth Grinders. Hardened Steel Specialties.**

**Hunter Saw and Machine Co.**

Pittsburgh, Pa.

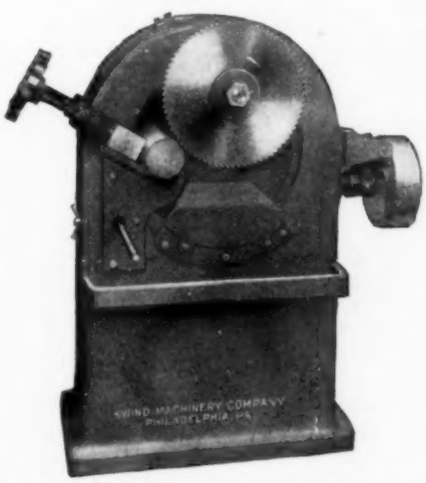
# SIMONDS
## METAL CUTTING SAWS
## SLITTERS AND SLOTTERS

Quality, efficiency and durability are recognized features which are found in all Simonds Metal Cutting Saws, Slitters and Slotters. They produce the maximum service at low operating cost. Made in all sizes for all metal cutting jobs.

**SIMONDS MANUFACTURING COMPANY**

*"The Saw Makers"*

17th St. & Western Ave. CHICAGO, ILL.
NEW YORK CITY
PORTLAND, ORE.
LOCKPORT, N. Y.
FITCHBURG, MASS.
NEW ORLEANS, LA.
SAN FRANCISCO, CAL.
LONDON, ENGLAND
VANCOUVER, B. C.
St. Remi St. & Acorn Av. MONTREAL, QUE.
MEMPHIS, TENN.
SEATTLE, WASH.
ST. JOHN, N. B.

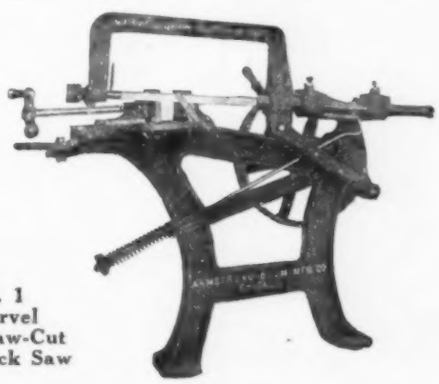


## Swind Cutting-Off Machine

An inexpensive yet efficient and practical automatic metal cutting-off machine in which the correct saw speed is found automatically by the machine itself. Saves time and avoids mistakes. Capacity up to 3¼ in. rounds.

*Send for Circular No. 50*

**SWIND MACHINERY CO.**
**Philadelphia, Penna.**



**No. 1 Marvel Draw-Cut Hack Saw**

## Save Time—Save Trouble

The deep jaw, quick-action vise and the automatic stop are time and trouble savers.

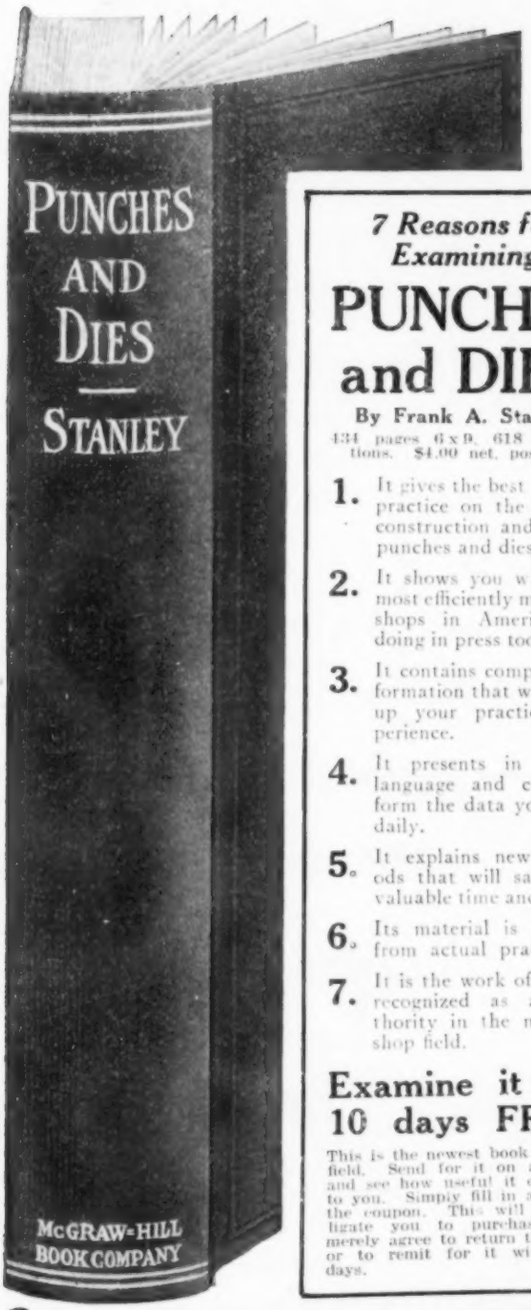
Cuts straight across because it uses a draw stroke. This eliminates any tendency of blade to buckle and stock is cut off perfectly straight.

**Capacity up to 4 x 4 in. square stock with 12 in. blade**

*Write for Catalog*

**Armstrong-Blum Mfg. Co.**
**347 N. Francisco Ave., Chicago, Ill.**

# JUST OUT




*7 Reasons for Examining*

## PUNCHES and DIES

**By Frank A. Stanley**

434 pages 6 x 9. 618 illustrations. $4.00 net, postpaid.

1. It gives the best modern practice on the layout, construction and use of punches and dies.
2. It shows you what the most efficiently managed shops in America are doing in press tool work.
3. It contains complete information that will back up your practical experience.
4. It presents in simple language and compact form the data you need daily.
5. It explains new methods that will save you valuable time and effort.
6. Its material is derived from actual practice.
7. It is the work of a man recognized as an authority in the machine shop field.

**Examine it for 10 days FREE**

This is the newest book in your field. Send for it on approval and see how useful it could be to you. Simply fill in and mail the coupon. This will not obligate you to purchase; you merely agree to return the book or to remit for it within 10 days.

*Free Examination Coupon*

McGraw-Hill Book Co., 239 W. 39th St., New York.

You may send me on 10 days' approval: **Stanley's Punches and Dies, $4.00 net, postpaid.** I agree to remit for the book or return it postpaid within 10 days of receipt.

Member A. S. M. E.?.....

Subscriber to American Machinist?.....

Signed .....

Address .....

.....

Official Position .....

Name of Company.....

(Books sent on approval to retail customers in the U. S. and Canada)

A.-9-25-19

Cut Shapes Like These with a GRAY'S Sheet Metal Cutter

Not a rotary sheer. Made in four sizes for cutting ⅛, ¼, ⅜ and ⅝ inch plate.

W. J. SAVAGE CO., Inc.
Knoxville, Tenn.

**"MILFORD" HACK SAW BLADES**

*"Go By The Name"*

Sample sent on request.

The HENRY G. THOMPSON & SON CO., NEW HAVEN, CONN.

**Disc Grinding Machinery**

*"When you think of a Disc Grinder, Think of a 'Gardner'"*

GARDNER MACHINE COMPANY
410 Gardner St., Beloit, Wis., U. S. A.

Some customers save 80% of their cutter bills by using

**Barnes Precision Cutter Grinders**

Adopted by the U. S. Government and the leading arms manufacturers

WILLIAM O. BARNES, Leominster, Mass.

CLOUGH'S
PATENT DUPLEX GEAR CUTTER

One Pair of these Cutters cuts every size gear from 12 teeth to a rack of same pitch. Gears run with B. & S. Involute. Regular pitches kept in stock. Special Cutters made to order.

Catalog of small tools free.

R. M. Clough, Meriden, Conn.

**Sterling Grinding Wheels**
Are No Experiment

They Have Been On The Market For Over 29 Years.

The Sterling Grinding Wheel Company Tiffin, Ohio

**PERSONS-ARTER**
ROTARY SURFACE GRINDER

A perfectly controlled precision machine, powerful and rigid enough to take maximum roughing cuts and then finish work to extreme limits. Indispensable to manufacturers of piston rings, thrust bearings, cutters, saws and the like. **Write for catalogue.**

Persons-Arter Machine Company
72 Commercial St., Worcester, Mass.

**"MAXF" GRINDING WHEELS**

WHEELS OF MAXIMUM EFFICIENCY FOR ALL GRINDING PURPOSES

MAXF GRINDING WHEEL CORP., CHESTER, MASS.
SEE OUR DISPLAY SPACE IN THE FIRST ISSUE OF EACH MONTH.

# Assured Production

IN THE final analysis a machine-tool, be it Lathe, Planer, Shaper, or what not, is only as efficient as the cutting-tool used to do the actual work. If the latter be a tool-holder which is weak or inefficient, the machine-tool is unable to exert its full power; a brake is applied to production; an insidious drag, sometimes hard to detect, holds back the department involved—eventually the whole plant.

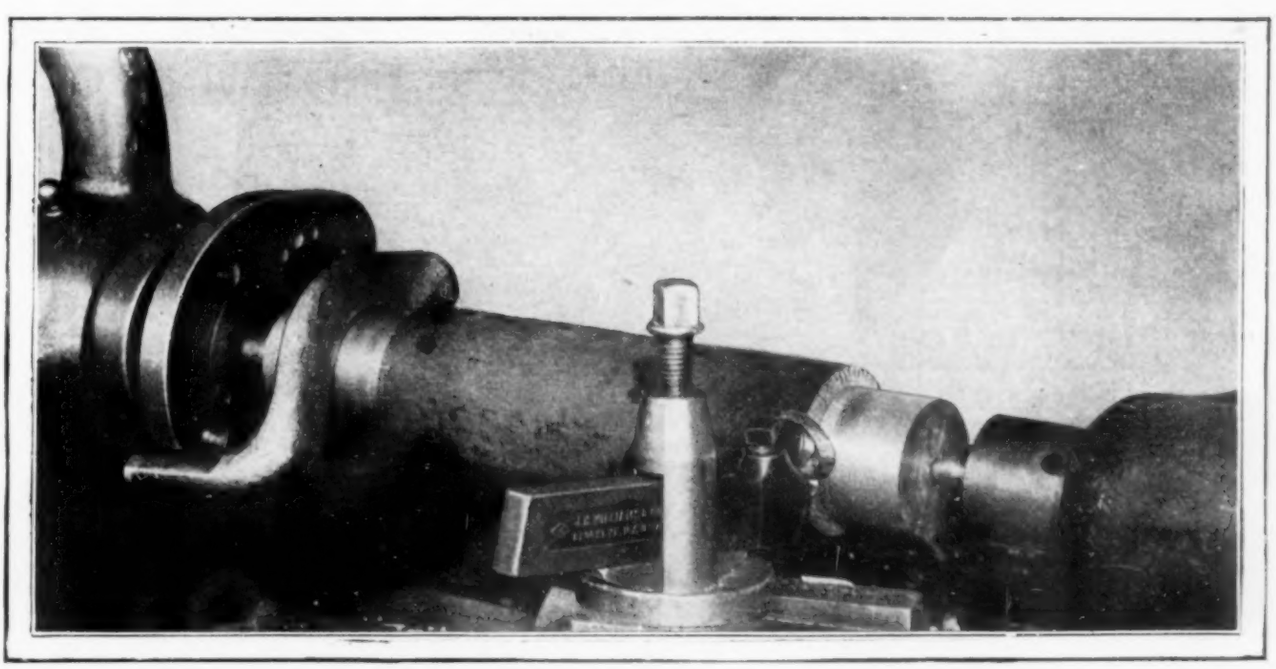
Williams' "Agrippa" Tool Holders are absolutely dependable, for they are the result of nearly half a century's experience in the specialized production of drop-forgings and drop-forged tools. They have been adopted as *standard* equipment in a host of the leading shops of the metal-working industries, because they assure maximum production at high speeds with heavy cuts. In stock for all regular machining operations:—Turning, Boring, Planing, Threading, Knurling, Cutting-off and Side work.

*Ask for your copy of our new catalog.*

J. H. Williams & Co.
"The Drop-Forging People"

35 SO. CLINTON ST., CHICAGO, ILL.
35 VULCAN ST., BUFFALO, N. Y.
35 RICHARDS ST., BROOKLYN, N. Y.

# Williams' "Agrippa" Tool Holders



Any Size
Any Shape
Any Style

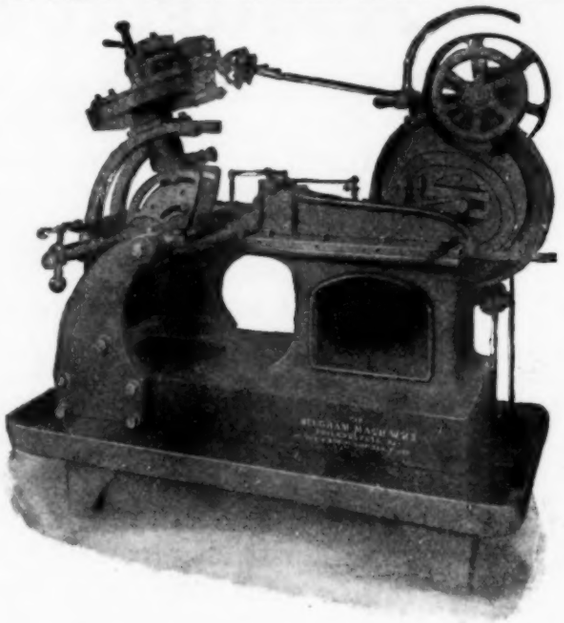
# GEARS

We have the special equipment and the experience that makes it possible to cut *any kind of gear* in record time. Ours is an emergency gear cutting service. We welcome your gear cutting difficulties.

**Write, wire or 'phone**

**Newark Gear Cutting Machine Co.**
Henry E. Eberhardt, President
**69 Prospect St., Newark, N. J., U. S. A.**

## BEVEL GEAR GENERATORS



# Bevel Gears

are cut by us theoretically correct, and so are adapted to fine machinery of all kinds. We have special facilities for cutting SPUR, WORM, SPIRAL, MITRE, INTERNAL and ELLIPTICAL Gear Wheels. Let us quote on your specifications.

**The Bilgram Machine Works** 1233 Spring Garden St. Philadelphia, Pa.

## GRANT Riveting Machines

*—From One up to Five Spindles*

Where it is expedient to head from two to five rivets at one stroke, we can furnish you with the Multiple Spindle Machines.

Rivets ⅛ inch in diameter headed not less than 1½ inches center to center; ⅜ inch rivets should not be less than 2 inches center to center. Made only to order. Further information gladly furnished.

**Horizontal Two-Spindle Riveting Machine**

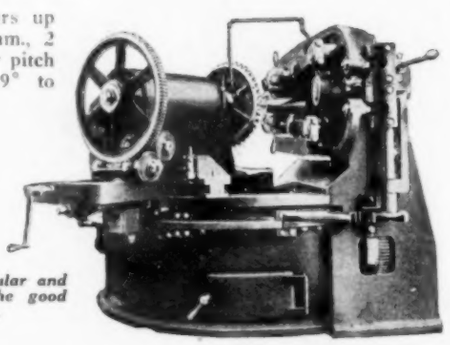
**Grant Mfg. & Machine Co.**
*85 Silliman Ave.*
**Bridgeport, Conn.**

TWO tools operating alternately on opposite sides of a tooth finish the blank in a single revolution. No more power consumed by this arrangement.

Templates guide the tools, correctly shaping the teeth. All index gearing boxed in the index head.

## The BROWNING Automatic Gear Shaper

Cuts all gears up to 24 in. diam., 2 pitch and any pitch angle from 9° to 81°.



*Send for circular and learn ALL the good points.*

**The Machine Products Company**
**East 179th St. and St. Clair Ave., Cleveland, Ohio**

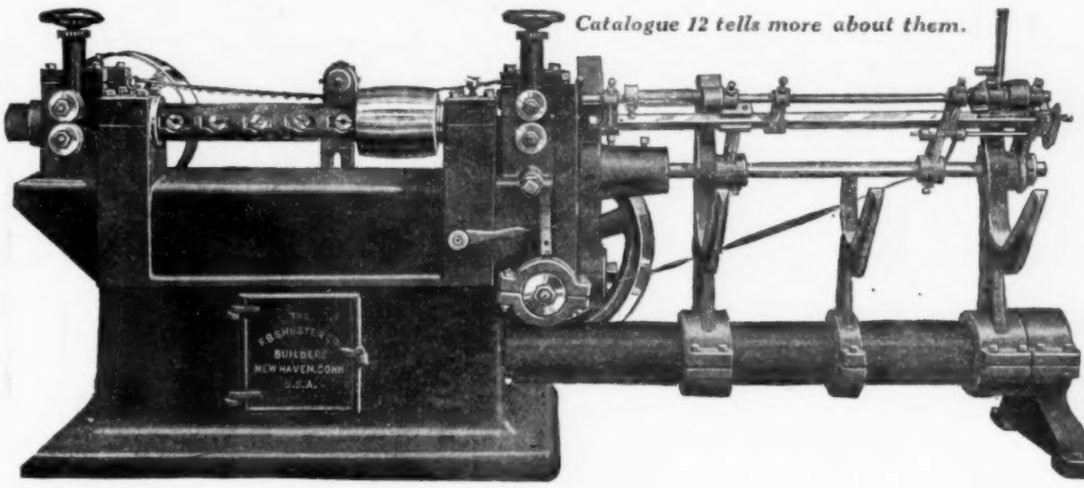
## Cut up your own wire on our

# Automatic Wire Straightening and Cutting Machine

## *and see how quickly it pays for itself*

Takes coil after coil, makes it perfectly straight, and cuts accurate lengths with little attention beyond placing the coils of wire.

Machines sold 25 and 30 years ago have been in *constant operation*, are in good condition today, and still good for several years' service.



*Catalogue 12 tells more about them.*

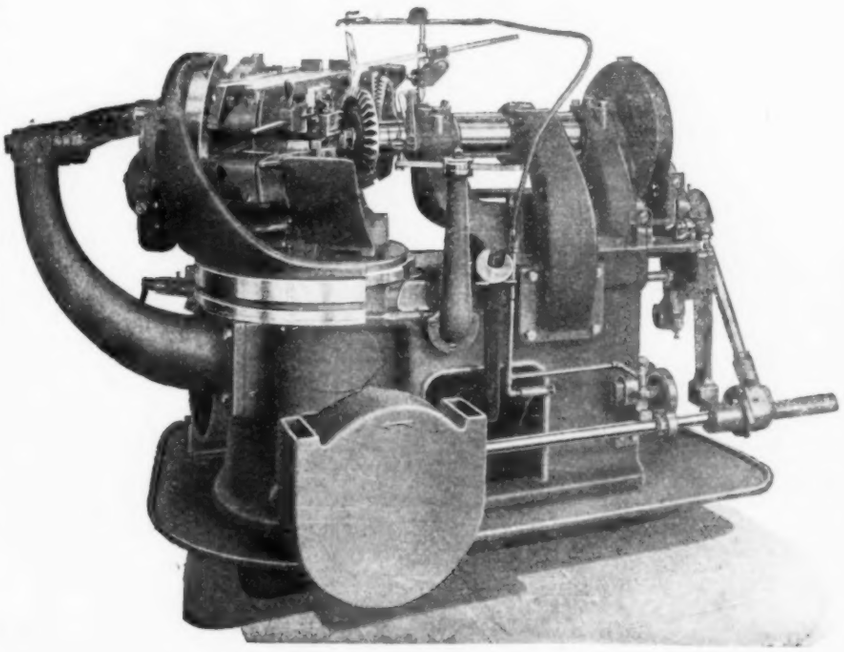
**The F. B. Shuster Co.**

New Haven, Conn.

Formerly John Adt & Son

*Established 1866*

Also Makers of Riveting Machines, Etc.



All Gears of the same pitch are cut with the same tools.

Speed of production has made this The Standard Bevel Gear Cutting Machine.

# GLEASON WORKS, Rochester, N. Y.

# Building Pumps
## With the aid of Air Tools

The modern pump making plant depends upon air tools to no small extent for economical and rapid production.

Sand Rammers are used to tamp the molds, Air Motor Hoists to handle them and Chipping Hammers and Grinders to trim and clean the castings; Air Drills and Reamers are used extensively in the machining process; and the assembly finds air tools at work seating studs, running up nuts and performing many other operations in a most efficient manner.

Air tools will help *your* production, and you will be well repaid for investigating them. Write to the nearest branch office listed below; you will receive a service that starts with a careful study of your problems and ends only when you cease using tools.

*When you write, ask for Catalog* 8000.

INGERSOLL-RAND COMPANY

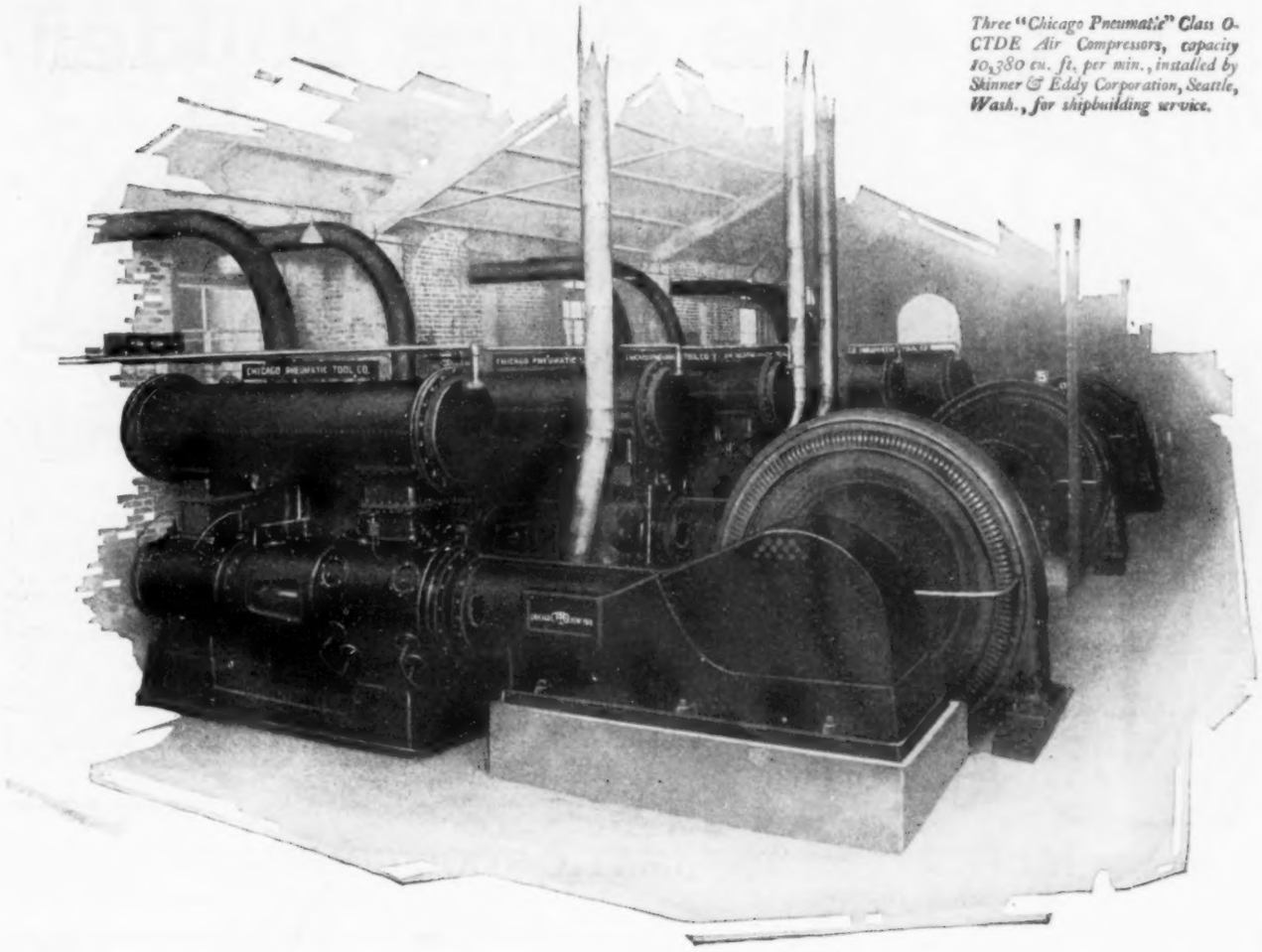
GENERAL OFFICES, 11 BROADWAY, NEW YORK

DOMESTIC OFFICES FOREIGN OFFICES

APPLY TO NEAREST OFFICE

148-PT

# Little David AIR TOOLS



*Three "Chicago Pneumatic" Class O-CTDE Air Compressors, capacity 10,380 cu. ft. per min., installed by Skinner & Eddy Corporation, Seattle, Wash., for shipbuilding service.*

# *Ideal Economy Under All Loads*

**Automatic regulation, assuring economical operation under variable load conditions, is an important feature of every one of the three hundred various sizes and types of "Chicago Pneumatic" Simplate Valve Air Compressors.**

**"Simplate" Indestructible Flat Disc Valves, exceptionally large bearing surfaces, totally enclosed frame construction, and automatic lubrication, are all important factors for dependability in "Chicago Pneumatic" Air Compressors.**

*Write for Bulletins*

**Chicago Pneumatic Tool Company, 1022 Fisher Building, Chicago**

*Branch Offices and Service Stations*

BIRMINGHAM BOSTON BUFFALO CINCINNATI CLEVELAND DETROIT ELDORADO EL PASO ERIE JOPLIN LOS ANGELES MILWAUKEE MINNEAPOLIS NEW YORK PHILADELPHIA PITTSBURGH PORTLAND RICHMOND SALT LAKE CITY SAN FRANCISCO SEATTLE ST. LOUIS TUCSON BOMBAY BRUSSELS HAVANA HONOLULU CHRISTIANIA LONDON MILAN MONTREAL OSAKA PARIS SYDNEY TOKYO TORONTO VANCOUVER WINNIPEG

BOYER PNEUMATIC HAMMERS · ROCK DRILLS COAL DRILLS LITTLE GIANT PNEUMATIC TOOLS · LITTLE GIANT ELECTRIC TOOLS

# CHICAGO PNEUMATIC

*The Compressor with* *The Simplate Valve*

CHICAGO PNEUMATIC AIR COMPRESSORS AND VACUUM PUMPS GIANT FUEL OIL, GAS, GASOLINE AND STEAM ENGINES

C26

# Thor ~the crane builder

Pneumatic Drills
Pneumatic Wood Boring Machines
Close Quarter Air Drills
Pneumatic Riveting Hammers
Chipping, Calking, Sealing and Flue-Beading Hammers
Hose and Hose Couplings
Pneumatic Grinders
Pneumatic Hoists
Pneumatic Holder-On
Pneumatic Sand Rammers
Electric Grinders
Electric Drills

Thor — the cranebuilder is a Powerful, Efficient and Enduring long stroke riveting hammer in which "usual bothers" never appear.

Thors are troubleless and, therefore, capable of adding dollars of profit to the coffers of any concern using them.

These trouble-proof qualities are the result of the patented design of Thor Pneumatic Hammers. The handle, barrel and valve chambers are all in one solid piece of steel forging rather than being encased in the usual "three parts."

Thor construction absolutely provides against air leaks as well as the troublesome use of couplings, clamps, keys, locknuts and other complicated mechanisms.

Economical riveting is dependent upon efficient hammers. Every man who desires to accomplish riveting with economy had best think of Thor. Don't wait till you need pneumatic hammers before getting acquainted with Thor.

Make the acquaintance of this good tool today by looking over the new catalog.

*Send for the complete catalog of Thor tools.*

## INDEPENDENT PNEUMATIC TOOL COMPANY

Chicago New York Pittsburgh Cleveland Detroit San Francisco Birmingham Montreal Toronto

---

Reg. U. S. Pat. Office

## METALWOOD MANUFACTURING CO. DETROIT

### Hydraulic and Hydro-Pneumatic Machinery

EXCLUSIVE SALES REPRESENTATIVES:
R. E. Ellis Engineering Co., 621 Washington Blvd., Chicago; Fairbanks-Morse & Co., Inc., 30 Church St., New York City; Sherritt & Stoer Co., Finance Bldg., Philadelphia, Pa.; Canadian Fairbanks-Morse Co., Ltd., Montreal and Toronto.

---

BOLTS EMPIRE NUTS-RIVETS

Every Empire Nut for the industries is cold punched from open hearth steel, and individually inspected before shipment.

## RUSSELL, BURDSALL & WARD BOLT & NUT COMPANY

PEMBERWICK, CONN. PORT CHESTER, NEW YORK ROCK FALLS, ILLINOIS

*Makers of Bolts, Nuts and Rivets Since 1845*

---

## Riveting in Record Time

The Townsend High Speed Riveting Machine strikes 80 to 1000 uniform, tapping blows every second. Quick as a wink, clean, smooth, finished heads are put on rivets. Different heights of rivets can be handled at one setting. The work itself is never distorted. **Write for circulars.**

**H. P. Townsend Mfg. Company**
Hartford, Conn.

---

## It's Substantially Built— This Sand Blast Machine

The Paxson Warren Sand Blast Machine is the most efficient made. Every part is accessible. Repairs are few and all wearable pieces easily replaced. Better cleaning—cheaper cleaning of castings. Circular on request.

**J. W. Paxson Company, 1021 N. Delaware Ave., Phila., Pa.**
Manufacturers' Foundry Equipment and Supplies

---

## HYDRAULIC TOOLS

Broaching presses, Benders, Pumps, Accumulators, Die presses, Punches, Shears, Shaft straighteners, Bolt forcers, Hydraulic fittings, etc. Write for catalogs. We build to order to meet special requirements

**WATSON-STILLMAN COMPANY**
42 Church St., New York
Chicago: McCormick Bldg.

W-S HYDRAULIC

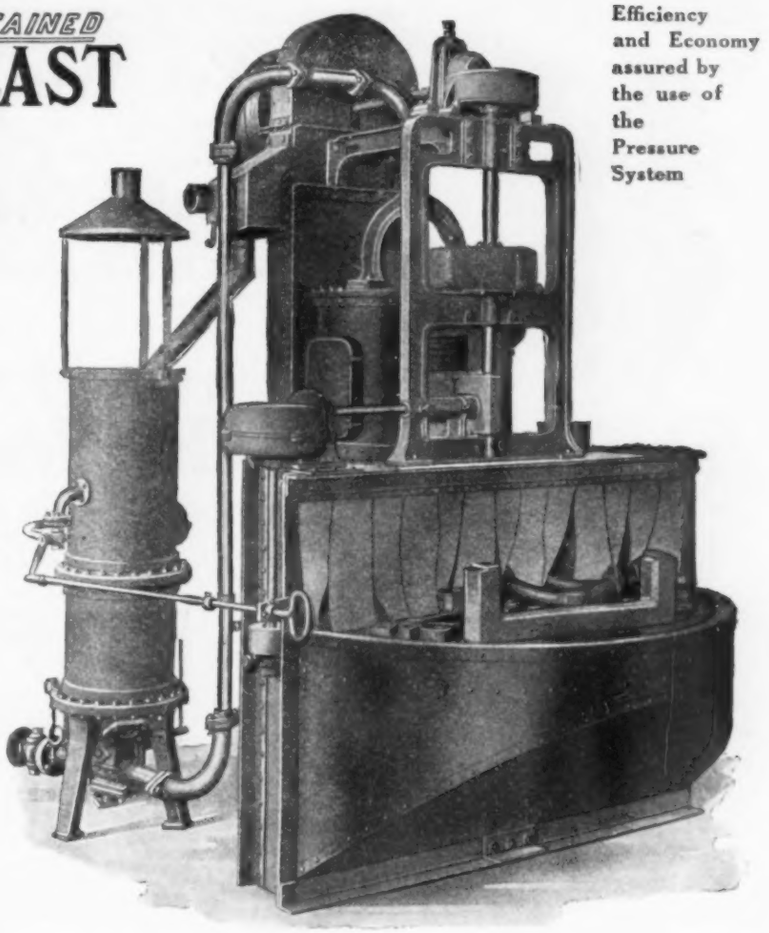
# DUSTLESS SELF-CONTAINED HOEVEL SANDBLAST AUTOMATIC MACHINES

25 years of **experience** have produced the most **efficient** equipment of every kind.

**Revolving Barrels** for small castings, **Rotary Tables** for medium sized castings, **Sandblast Rooms** for last castings, affording **protection** from **dust** for the operator, **Hose Sandblast** and every other type of sandblast equipment. Write for catalog E.

Meet us at Booth 242-244 at the Foundrymen's Exhibition.

**Hoevel Manufacturing Corp.**
158 Ogden Ave., Jersey City, N. J.
Controlled by L. O. Koven & Bro
Cleveland Office: 503 American Trust Bldg.



**Efficiency and Economy assured by the use of the Pressure System**

## CLEVELAND AIR DRILLS

Ball Bearing Type
DRILLING, REAMING, TAPPING, AND FLUE ROLLING

MADE IN
61 Styles and Sizes
Reversible and Non-Reversible
Few Parts Used in Construction
Low Cost of Maintenance in Service

**We Make** { CHIPPING AND RIVETING HAMMERS, SAND RAMMERS, COMPOUND DRILLS, CORNER DRILLS & EMERY GRINDERS.

**Bowes' Air Hose Couplings**
Standard Equipment Everywhere

AIR TIGHT

Above cut shows application of Cleco Never-Slip Hose Clamp to Bowes' Couplings. We guarantee that no "Blow-offs" can occur if Cleco Never-Slip Clamps are used.

WRITE FOR BULLETINS NOS. 34a, 41 and 43

**The Cleveland Pneumatic Tool Co.**
New York Chicago CLEVELAND, OHIO Philadelphia Detriot
Pittsburgh St. Louis San Francisco, Calif.
Cleveland Pneumatic Tool Co. of Canada, Ltd., Toronto, Ont.
John MacDonald & Co., Pollokshaw, Glasgow, Scotland

# Elmes-Chicago Hydraulics

We make everything in hydraulic machinery. Of course we don't make all the hydraulic machinery in the world, but we make the best of it. Over half a century's experience enables us to handle your hydraulic problems skillfully.

*Send your blueprints for estimates.*

*Write today for the Elmes Bulletin.*

Charles F. Elmes Engineering Works
1001-1013 Fulton St., Chicago, U. S. A. Est. 1863

# "Yes, We Did Stretch Ourselves a Bit"—*Phillie Gear is saying to a customer who is surprised to learn that a certain ticklish job is finished—*

"But then you told me you needed the gear badly, so I felt we just had to get the job out today. It is leaving the shop now."

# This Is The Job He Was Talking About

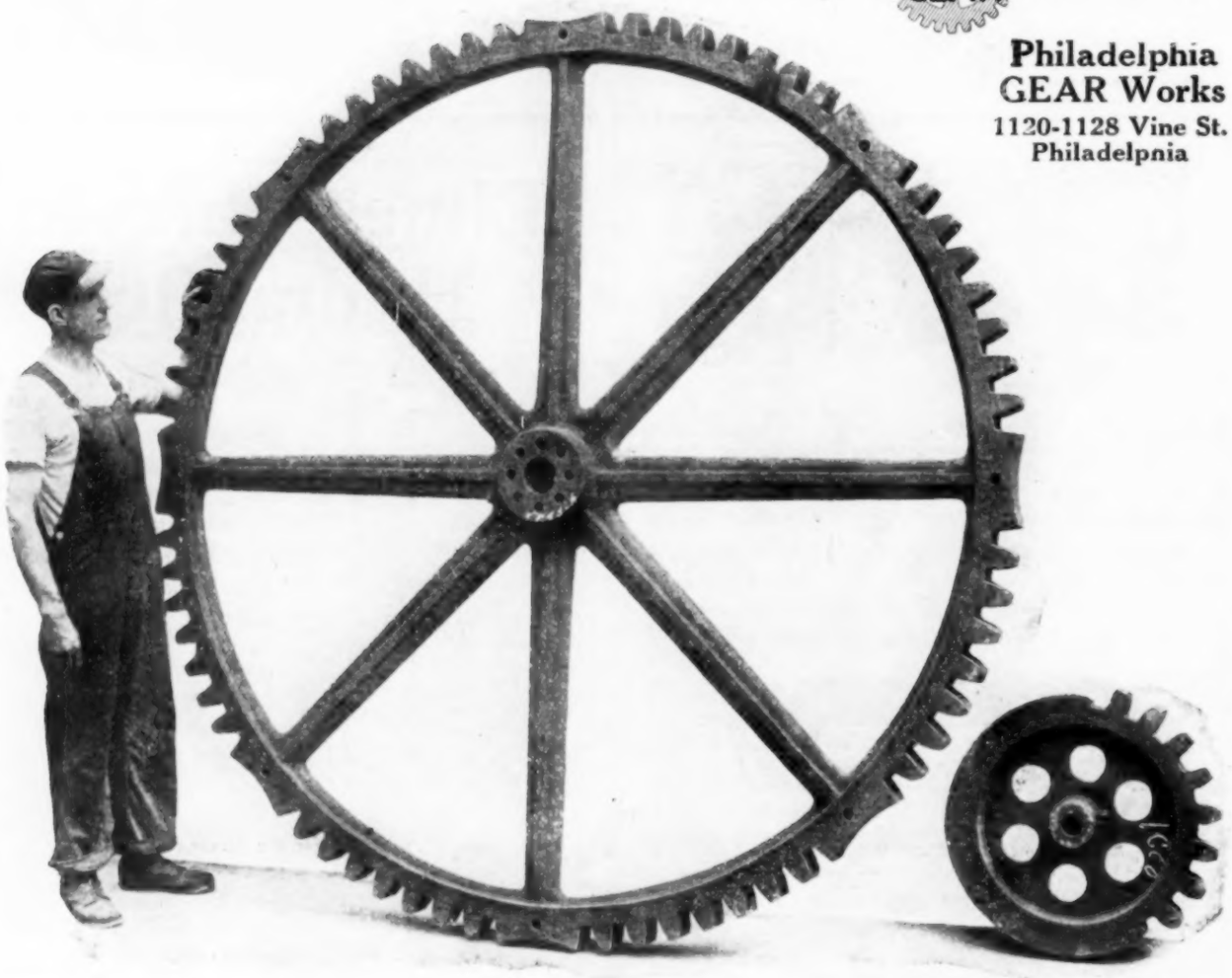
It's the kind of job you wouldn't expect much speed on—that is if you do not know Phillie Gear and his methods.

If you do, you are well aware that he proves equal to every emergency, looking on each rush order as if it were a "life-or-death" proposition and finishing it when, or before, it's due—never afterward.

Time him on your next speed order for a spur gear, bevel gear, worm, spiral or helical gear or sprocket.

Philadelphia GEAR Works 1120-1128 Vine St. Philadelphia

**Philadelphia GEAR Works**
**1120-1128 Vine St.**
**Philadelphia**



# Don't blame your men if they can't hear you!

How many first-class mechanics are working in your shops under the handicap of partial deafness, inflicted on them by gear noises that are unnecessary and easily avoidable?

## NEW PROCESS RAWHIDE PINIONS

will let a man keep his mind on his work. Instead of the racket and grind that force a man to close his ears to outside impressions, *new process* RAWHIDE PINIONS make quietness the rule with geared machinery.

Where *new process* RAWHIDE PINIONS are in use, workers are not deafened by an incessant, nerve-racking roar or grind that requires an order to be shouted to be understood. The misunderstandings, mistakes and accidents common where ordinary gear noise exists, largely disappear and the greater alertness and attention that quiet working conditions make possible are unmistakably reflected in the better and increased output.

You owe it to yourself and to your men in these days to get the most out of the man power at your disposal. *New process* RAWHIDE PINIONS are certain aids to efficiency. One of them on the worst offender among your gear drives will prove what we say.

***Let us save you money on metal gears***

We make metal gears in all the popular types and sizes and have every facility for first-class product, attractive price and quick delivery.

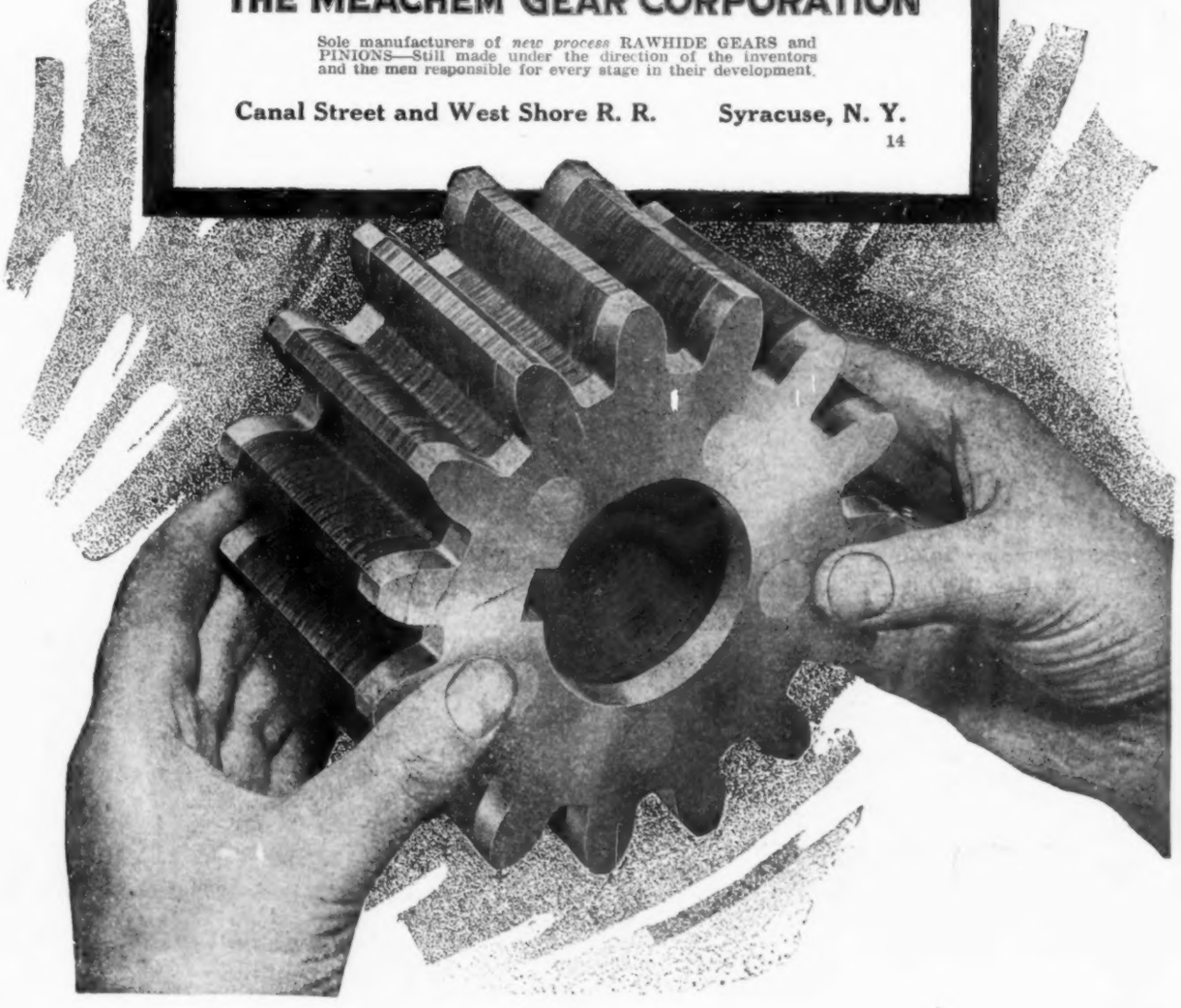
Our staff of gear designers together with our precise measuring devices and rigid inspection system would make our proposition interesting if you investigated.

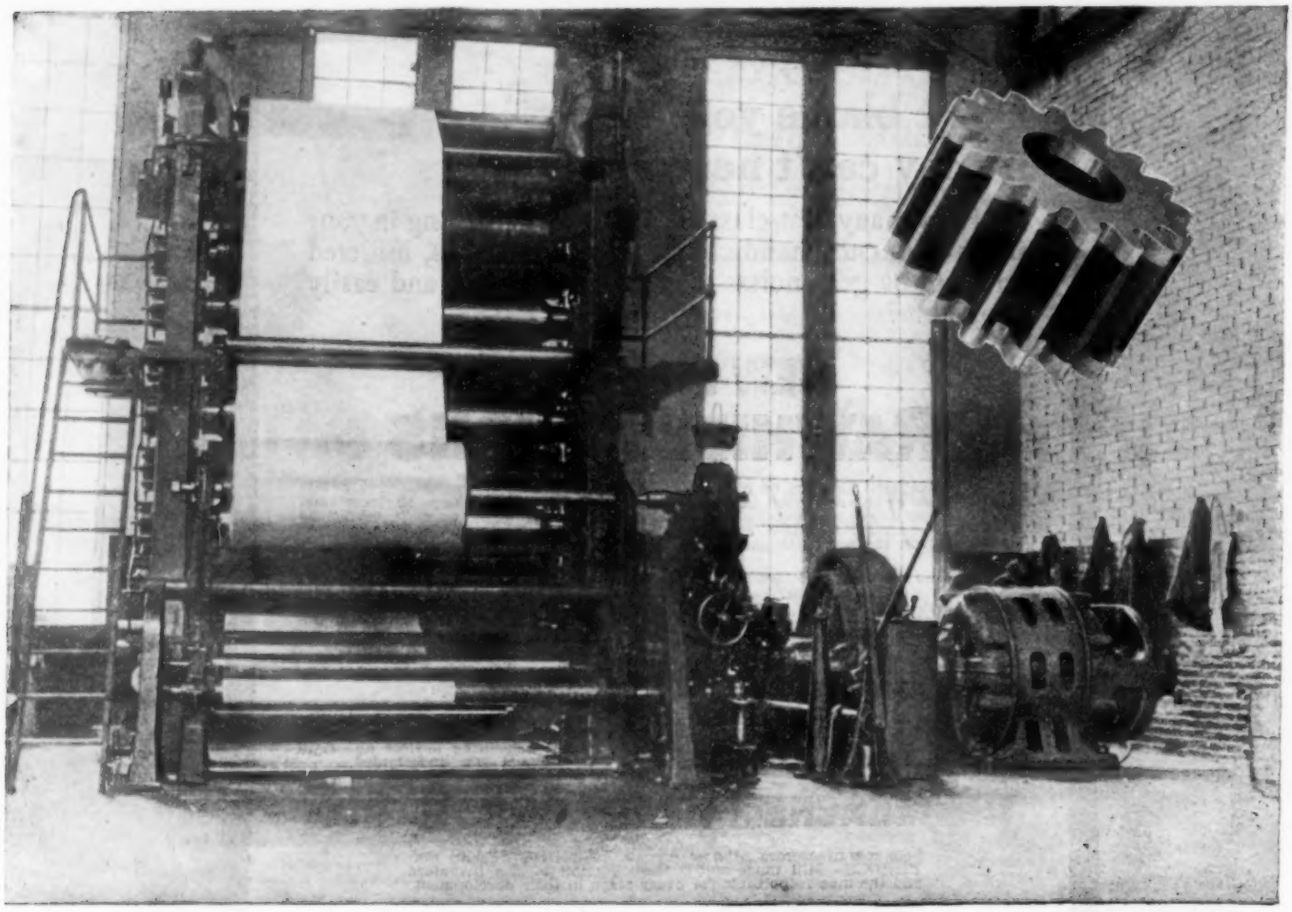
## THE MEACHEM GEAR CORPORATION

Sole manufacturers of *new process* RAWHIDE GEARS and PINIONS—Still made under the direction of the inventors and the men responsible for every stage in their development.

**Canal Street and West Shore R. R. Syracuse, N. Y.**

14





# A Fabroil Gear Saves Every Part of the Machine

On account of their resiliency, durability and tensile strength

## Fabroil Gears

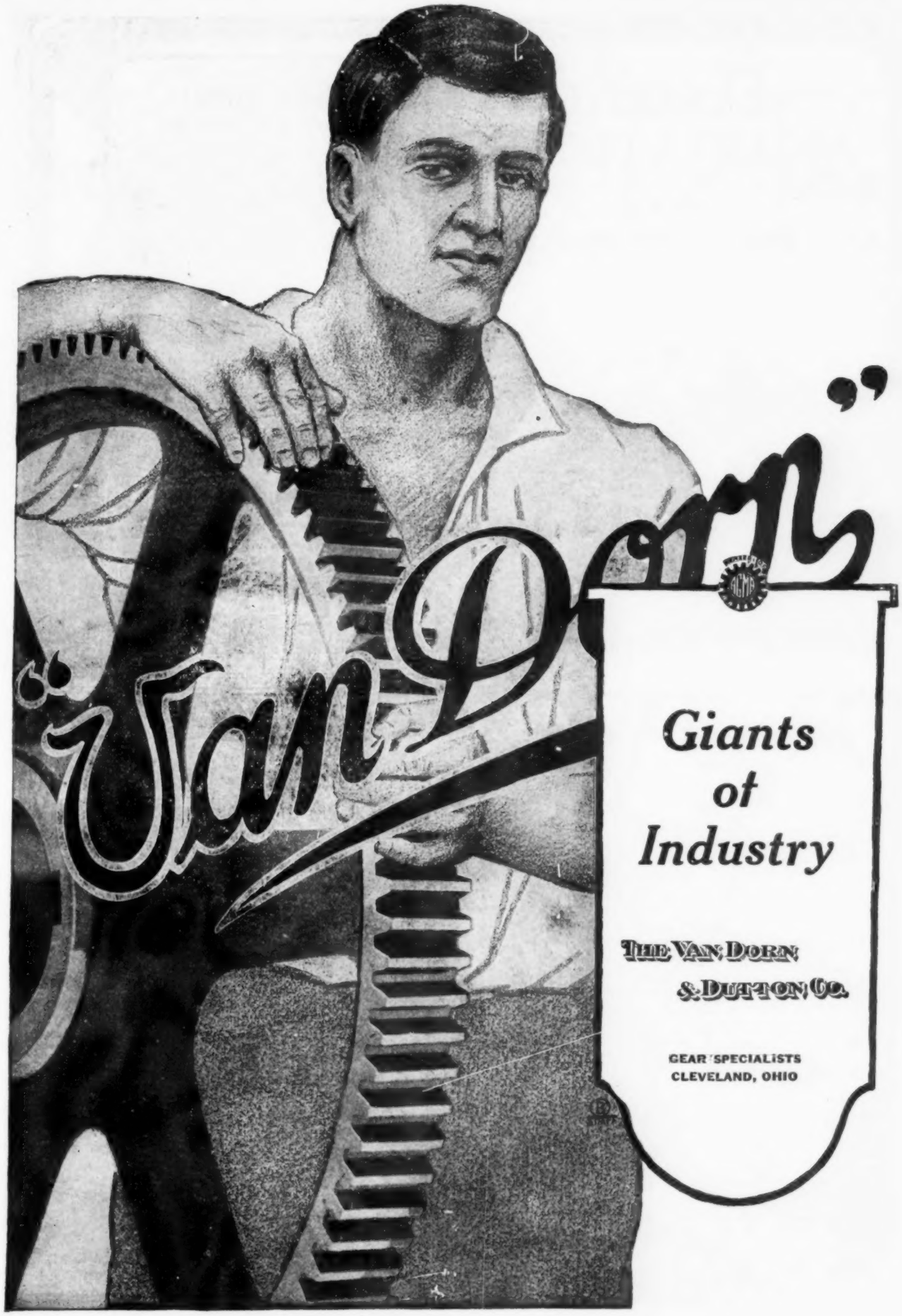
are themselves economical. Their greatest money-saving possibilities, however, are found in the additions they make to the serviceable lifetime of the machines on which they are used.

They absorb the vibration of practically every part and save wear on the gears with which they mesh. Shocks of reversal or sudden speed changes are also taken up and softened by the fabroil teeth and much destructive friction is eliminated.

***For your machines' sake, use Fabroil Gears***

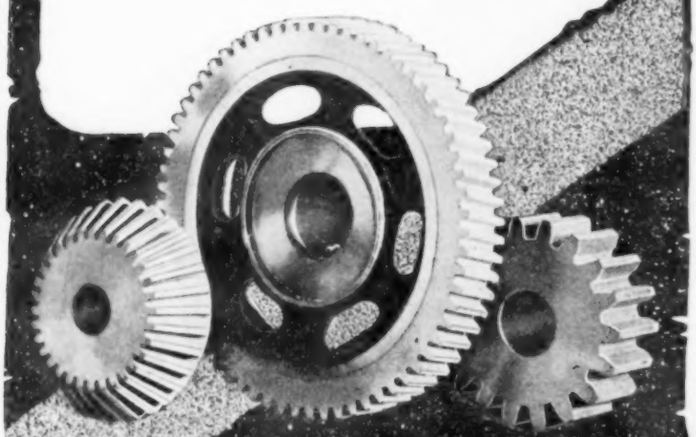
**General Electric Company**

General Office Schenectady, N.Y.


"Van Dorn"
Giants of Industry
THE VAN DORN & DUTTON CO.
GEAR SPECIALISTS
CLEVELAND, OHIO

# BAKELITE MICARTA PINIONS

## Are a Paying Investment



**Bakelite Micarta Gears and Pinions**

May be made in spurs, spirals, or bevels with or without steel or cast iron centers, thus making considerable saving in material cost.

BAKELITE gears and pinions may be made without plates or rivets as is necessary with rawhide, and they are not affected by oil, moisture or other substances that ruin rawhide.

Bakelite gears and pinions possess many advantages over other materials when it is desired to reduce noise, chatter, vibration and friction. THEY REDUCE WEAR TO A MARKED DEGREE.

**W. A. Jones Foundry & Machine Company**

**Established 1890**

**4404 Roosevelt Rd., Chicago**

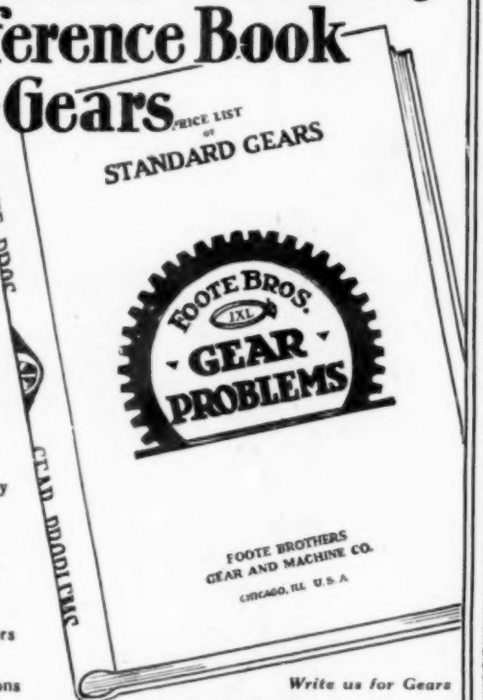
**30 Church St., New York**

# PEERLESS

## RAWHIDE GEARS

The Horsburgh & Scott Co.
Cleveland, Ohio

# Send for this Ready Reference Book on Gears




Spur
Bevel
Mitre
Spiral

Worm
Internal
Helical
Tractor

Traction Engine

Heavy Duty Hardened Gears

Raw Hide Pinions

Speed Transformers

Tractor Transmissions

*Write us for Gears*

**Foote Bros. Gear & Machine Co.**

232-242 N. Curtis Street, Chicago, Ill.

# Now There!

## This will keep you quiet for some time

Remember, that absence of gear noise is the outward sign of absence of gear wear.

And that is why Texaco Crater Compound, the great gear lubricant, is instantly adopted in any shop where a demonstration is made.

Machinists know that noise means wear, waste, and confusion. Gears quieted by Texaco Crater Compound last longer—transmit more power, and by their very quietness, improve the morale of the shop.

Texaco Crater Compound is a pure, unadulterated lubricant, easily applied to gears, and, once applied, sticks to them for a long time, keeping the teeth coated with a rich, heavy, wear-defying, temperature-resisting film.

## Use Texaco Crater Compound for all exposed gears

Texaco Crater Compound is only one of the Texaco Line. In the Texaco Line you will find the right lubricant for any machine or power unit. And a great many machine builders know this and are recommending Texaco Crater Compound and other Texaco Lubricants for use on the machines they make and sell.

Their only thought in doing this is to benefit by the good-will occasioned by the improved service obtained from the machines they make when satisfactorily lubricated.

# THE TEXAS COMPANY

**Dept. A-4, 17 Battery Pl., New York City**

**New York Chicago Houston**

***Offices in Principal Cities.***

LONDON OFFICE:
Texaco Petroleum Products Co., Ltd., Distributors for the United Kingdom. Head Office—22 Billiter St., London, E. C.

# GRANT GEARS

accurately cut in cast iron, steel, brass, rawhide and fibre.

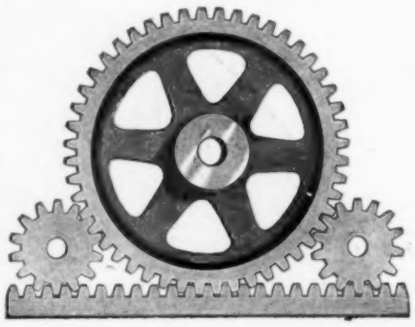
Our large new factory equipped with the very latest gear cutting machinery and a works organization that is backed by 40 years' experience in gear cutting enables us to meet every possible gear requirement from minute pinions to wheels 6 ft. in diameter.

We are prepared to give immediate attention to rush orders and can make prompt shipments on any special type of gearing.

Large stock of standard cut gears constantly on hand, ready to be shipped at once.

Send us your blueprints for estimate. Let us solve your gear problems.

**Write for interesting catalog containing full stock list and valuable gear information.**



**Grant Gear Works, Inc.**
**151 Pearl St. Boston, Mass.**

## Every Tooth Does Its Bit

There are no "slackers" among Cincinnati Gears. Every tooth is "up and at 'em" when the "push" begins.

We put Cincinnatis through such a rigid "physical" test that none except the absolutely fit ever reach the front.

**CINCINNATI SERVICE**

awaits your pleasure in the matter of bevel, mitre, spur, spiral, internal and rawhide gears, worms and worm wheels. It is quick, reliable and justly priced. Get our Catalog "C."

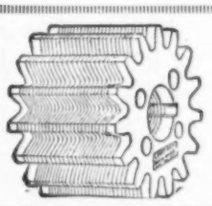
**Cincinnati Gear Co., Cincinnati, Ohio**

## MEISEL QUALITY

The same superior quality is maintained throughout the entire line of Meisel Gears — accuracy, durability and expert workmanship. Also Automatic Screw Machine Products up to 5½-in. diameter.

**Meisel Press Mfg. Co.**
946 Dorchester Ave.
Boston, Mass.

Reg.



## Chicago-Rawhide Pinions

The best that selected material and careful workmanship can produce

**The Chicago Rawhide Mfg. Co.**
1301 Elston Avenue, Chicago, Ill.

# GEARS

**Let us quote you on your small gears.**

**Meisselbach-Catucci Mfg. Co.**
28 Congress Street Newark, N. J.

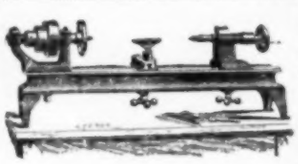
## FAWCUS-HERRINGBONE GEARS

Mill Drives . Turbine-Transmissions
Spur Gears-Bevel Gears-Worm Gearing
**FAWCUS MACHINE COMPANY. PITTSBURGH.PA.**

## Automatic Gear Cutting Machines

Spur Mitre Bevel **GEARS** Cut To Order

THE FLATHER MFG. CO. FLATHER MACHINERY NASHUA N.H. U.S.A.



**It's Worth Looking Into**

Here is a Speed Bench Lathe which will adapt itself to "a hundred and one" uses in your shop. It takes a full swing of 8 inches and is 20 inches between centers. There are many good features in the Oliver we want you to know. **Write for them now.**

**The W. W. Oliver Mfg. Co.**
1480 Niagara St., Buffalo, N. Y.

## ALBRO-CLEM HINDLEY GEARING

**WILL DO THE WORK**
**When Common Worm Gearing Fails**
**ALBRO-CLEM ELEVATOR CO.**
**503 Erie Ave., East, Philadelphia, Pa.**

## GEARS

BEVEL—SPUR—WORMS—SPIRAL
Up to 60 Inches
*We solicit your inquiries*
THE TAYLOR MACHINE CO.
Cleveland, Ohio

## GEARS

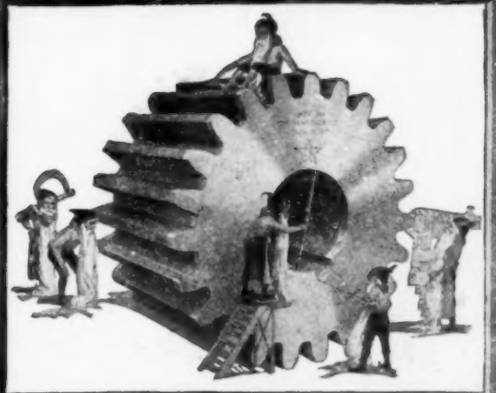
**Spur, Spiral and Worm Gears**

## SCREWS

**Lead Screws, Feed Screws, etc.**

*Your inquiries promptly answered.*

**Alling-Lander Co., Inc., Sodus, N. Y.**



# GANSCHOW

"QUALITY"
RAWHIDE AND BAKELITE
PINIONS
WILLIAM GANSCHOW COMPANY
CHICAGO ☆ ILLINOIS

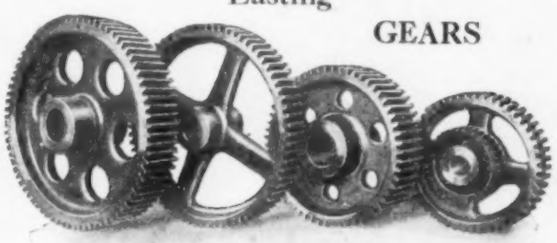
# CROFOOT GEARS

*We solicit an opportunity to quote on your gear requirement.*

CROFOOT GEARS
TRADE MARK

Crofoot Gear Works
Incorporated
31 Ames Street Cambridge, A Branch, Boston

Well designed, carefully made,
Accurately cut, completely finished,
Lasting
GEARS



CARPENTER-TEW GEAR CO.
Bush Terminal, Brooklyn, N. Y.

## To Turbine Builders

You can get higher speed, lighter weight, lower cost, by the use of

**CLEVELAND WORM GEAR REDUCTION UNITS**

*Write us for full information on this business expanding device.*

Cleveland Worm Gear Company
*America's Worm Gear Specialists*
Cleveland, Ohio

## "Zones of Quiet"

Albaugh-Dover accurately generated Gears are real "ZONES OF QUIET"—unusually smooth and noticeably silent in operation. If you use gears, send us your Blue Prints or Sample Gears for estimates.

AD
ALBAUGH-DOVER CO.
2100 Marshall Blvd., Chicago

GEARS

**STOCKS IN**

BOSTON
BUFFALO
CHICAGO
CINCINNATI
CLEVELAND
DAYTON
DETROIT
INDIANAPOLIS
MILWAUKEE
N. Y. CITY
PHILADELPHIA
PITTSBURGH
SAN FRANCISCO
ST. LOUIS

# BOSTON GEARS

*The World's Standard*

1200 SIZES IN STOCK FOR IMMEDIATE DELIVERY

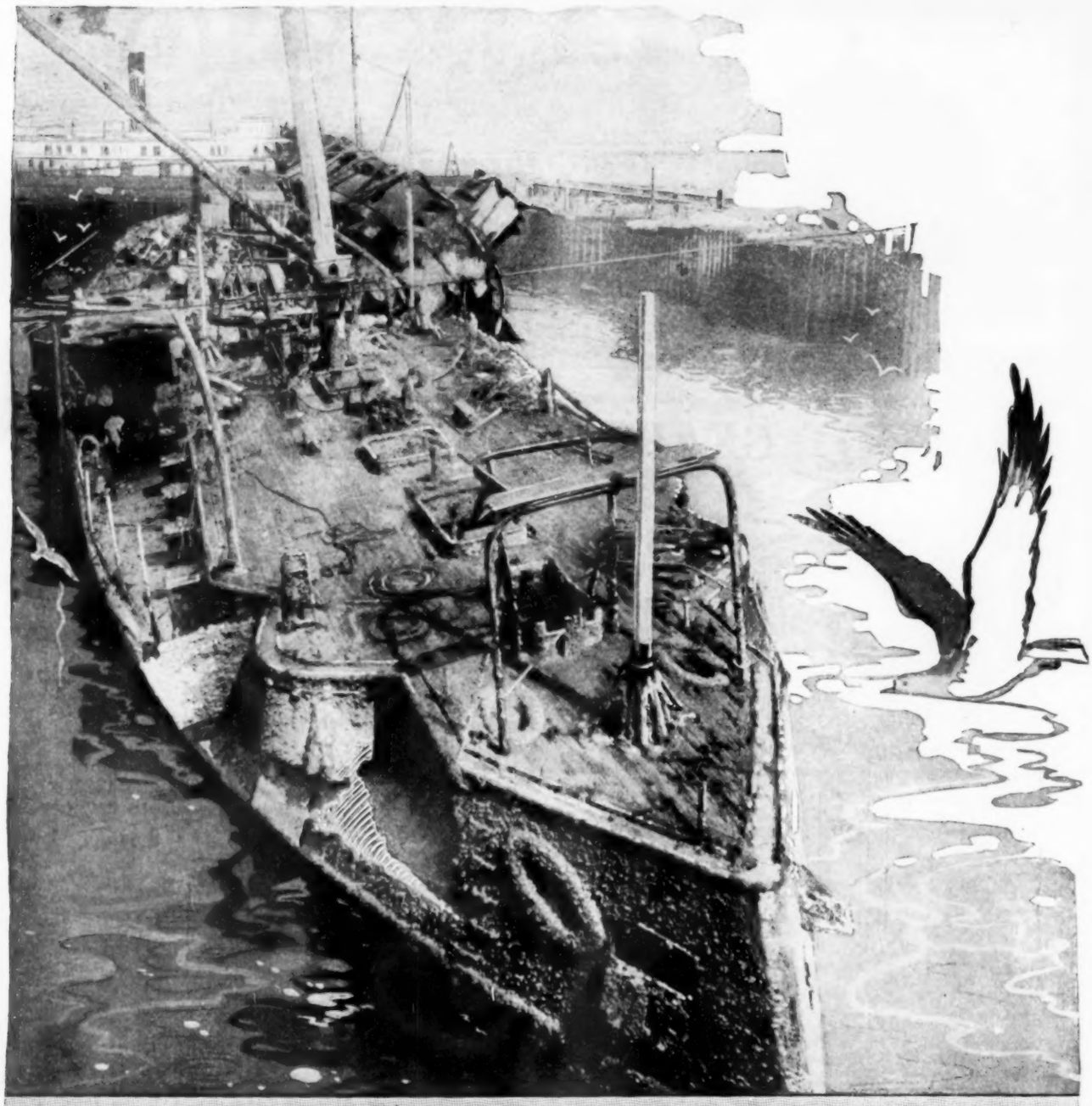
*Send for 1919 catalog giving sizes and list of stores that carry a stock*

GEARS TO ORDER IN LARGE QUANTITIES A SPECIALTY

BOSTON GEAR WORKS MAIN OFFICE AND FACTORY NORFOLK DOWNS, QUINCY, MASS.
CHICAGO BRANCH—623-625 WEST WASHINGTON BOULEVARD

**Stock Styles**

BEVELS
INTERNALS
MITERS
PINION WIRE
RACKS
SPIRALS
SPURS
WORM GEARS
WORMS
BALLS
BEARINGS
BUSHINGS
CHAINS
GEAR GAUGES
JOINTS



PUMPS–COMPRESSORS–CONDENSERS–OIL & GAS ENGINES–

*From Photo © Brown Bros., New York City*

# WORTHINGTON

**Worthington Works**
*Harrison, N. J.*
**Blake & Knowles Works**
*East Cambridge, Mass.*
**Deane Works**
*Holyoke, Mass.*
**Hazleton Works**
*Hazleton, Pa.*

# Sunk with the Maine, this pump helped to raise her

FOURTEEN years at the bottom of the sea—and still a good pump. That is the record of a Worthington Pump (made in our Blake & Knowles Plant) which went down in 1898 with the Maine. Several years ago, when the famous old battleship was raised, this pump with but two new parts—a piston rod and a valve rod—was connected up and assisted in unwatering the vessel.

That the Navy did not need this evidence of endurance and stamina, however, has been amply proven by the fact that most of the vessels of the American Navy are now equipped with Worthington pumps.

The ability of Worthington to meet the exacting demands of the naval engineers is but another reason why the name Worthington is usually found in well-planned industrial plants.

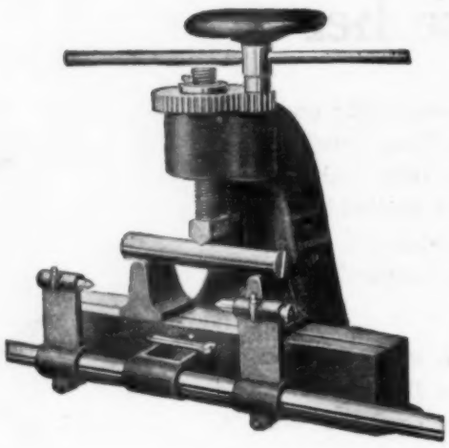
WORTHINGTON PUMP AND MACHINERY CORPORATION
*Executive Offices:* 115 Broadway, New York City
*Branch Offices in 24 Large Cities*

-METERS-MINING-ROCK CRUSHING & CEMENT MACHINERY

# WORTHINGTON

Snow-Holly Works
*Buffalo, N. Y.*
Laidlaw Works
*Cincinnati, Ohio*
Power & Mining Works
*Cudahy, Wis.*
Gas Engine Works
*Cudahy, Wis.*

## Geier Straightening Presses



Scientific management is based principally on the use of labor-saving equipment for reducing production costs. Geier Straightening Presses will quickly pay for themselves in any shop by reducing labor and saving good materials from the scrap pile.

***Catalog on Request.***

**THE P. A. GEIER COMPANY**
**5102 St. Clair Ave., Cleveland, Ohio**

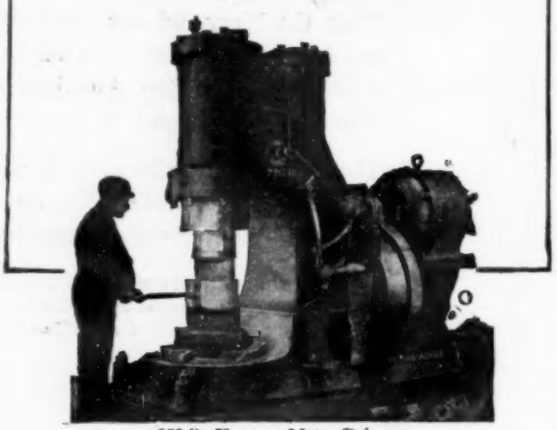
## Three Words—

Powerful — Efficient — Economical. They are synonymous to

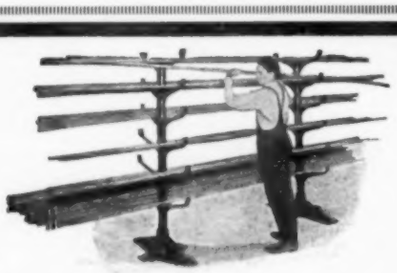
## The Nazel Air Hammer

Built in sizes from 75 to 850 lb.—for belt or direct motor drive. By the way, have you a copy of the Nazel Hammer Book? We think you'll enjoy reading it.

**Nazel** Engineering and Machine Works
**4039 N. 5th St. - Philadelphia, Pa.**



850-lb. Hammer Motor Driven



## SAVED—

**time, temper and shoe leather**

with more bar stock stored in the same quarters. There is a modern way of storing bar stock—it's the way of the BROWN

## Sectional Stock Rack

***(Made of steel in interlocking sections)***

No secret—just a SAVING SIDE LIFT instead of a losing end pull (the old way). A Brown Sectional Stock Rack is money-saving equipment. Let us tell you WHY.

**Brown Engineering Company**
**115 No. Third Street, Reading, Pa.**

2014-N

**A better way to mark economically**

You'll find that the Dwight Slate Marking Machines are more economical and turn out better and neater work.

It will pay you to investigate this method of improving the appearance of your product. Get the Catalog No. 10.

**We also manufacture Filing Machines, Grinding and Polishing Machines and Steel Stamps, and can serve you satisfactorily on your Steel Die Engraving.**

**Noble & Westbrook Mfg. Co.**
**19 Asylum Street**
**Hartford Connecticut**

## HEAT TREATING FURNACES

of all kinds designed and built. Oil and Gas Burners and complete burning equipment.

**Tate-Jones & Company, Inc.**
**Pittsburgh, Pa.**
**New York Chicago St. Louis San Francisco Buffalo**

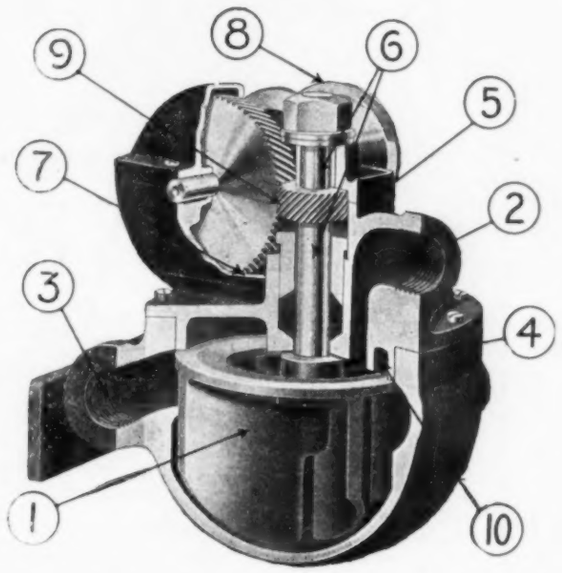
**New oil from old oil——**
**New waste from waste waste**

no more than a trace of oil remains in oily-chips after passing through this machine. Same is true of waste. The reclamation in both cases is the limit of mechanical possibilities. ¶ Centrifugal; direct steam turbine drive. Quadruple capacity of belt driven machines. Quicker, better; more easily charged and discharged; less driving power; longer life. Every possible feature for ease in handling. **Write for full data.**

**Savoil Separators**

**Oil & Waste Saving Mach. Co. Real Estate Trust Bldg., Phila., Pa.**

## *Ten important features of the*
# VOLYUM COOLANT PUMP




1. The open type impeller has clearance on all sides. No shaft bearing in the pump body to be ruined by grit.
2. Suction intake is located above the discharge outlet, eliminating loss of prime.
3. Large, horizontal volute, prevents clogging caused by sediment.
4. The driving mechanism can be swiveled to meet any installation requirement.
5. The cap forms a cover for the driving mechanism.
6. A long bearing on either side of the pinion insures long life.
7. The gear runs in an oil bath, providing splash lubrication for all shaft bearings.
8. The 3-inch flanged pulley can be placed on either side of the cap; a gear or sprocket wheel can be used.
9. Right angle spiral gear drive, 3 to 1 ratio, silent and easy running.
10. The pump can be reversed without discharging the prime through the suction opening.

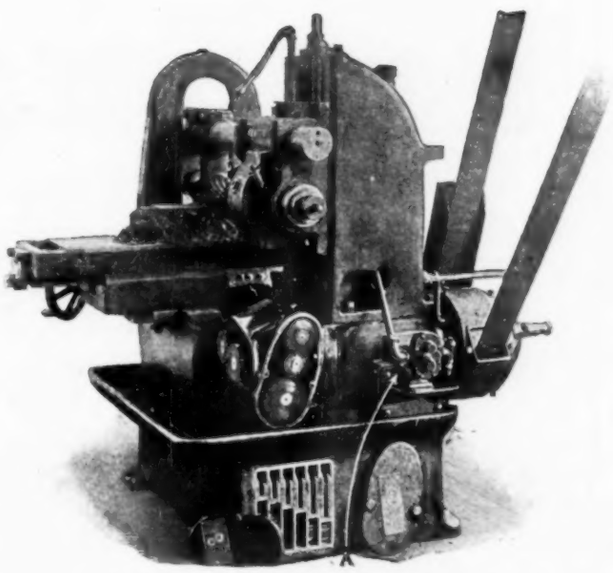
These features enable the Volyum pump, to deliver a heavy stream of either compound or cutting oil, with unfailing steadiness. The result is increased production and more pieces per tool grind.

***Send for our booklet—"Full Facts"***

**The Volyum Pump Co.**
**419 West Liberty Street**
**Cincinnati, Ohio, U. S. A.**

# Another Proof of TRAHERN Superiority

## For Machine Tool Use



Kempsmith "miller" equipped with a TRAHERN LUBRICATING PUMP which again proves their superiority as Machine Tool Lubricating Pumps.

is shown in the illustration of Kempsmith's standard milling machine equipped with a TRAHERN Lubricating Pump.

This is not a chance installation or for trial purposes. Kempsmith install TRAHERN Lubricating Pumps as regular equipment before their machines leave their factories.

Kempsmith realizes that adequate lubrication is not only desirable; but absolutely necessary for maximum efficiency in a machine tool.

They install good lubricating pumps and leave nothing to chance—a good policy for you to follow.

***Write for Booklet 44.***

**TRAHERN PUMP CO.**
**Rockford, Illinois**

# Experimenting is Costly

Don't experiment with a hammer you are not *sure* will prove an efficient, honest tool. It will be cheaper for you to ask us because—

For 46 years we have made

## BRADLEY HAMMERS

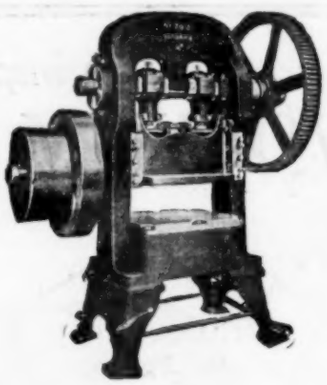
as hammers should be made.

*Let us tell you what we know of forging. It may help.*

**C. C. Bradley & Son, Inc.**

**Syracuse, N. Y.**

England, Buck & Hickman, Ltd., London; France, Fenwick Freres & Co., Paris, Lyon, Rhone; Italy, Fenwick Freres & Co., Turin; Belgium, Fenwick Freres & Co., Liege; Brazil, Fenwick Freres & Co., Rio de Janeiro; Switzerland, Fenwick Freres & Co., Zurich; Portugal, Fenwick Freres & Co., Lisbon; Spain, Fenwick Freres & Co., Barcelona.



# NIAGARA

## Double Crank Presses

are built for strength and speed. Slide motion is obtained by a double crank, insuring an evenly distributed pressure. This powerful, heavy duty machine means a large output at low cost.

**Ask for Copy of Complete Press Catalog.**

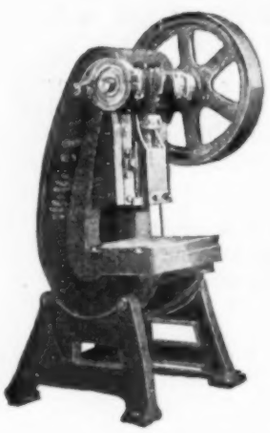
**Niagara Machine & Tool Works**

**Buffalo, N. Y., U. S. A.**

# The "TOLEDO"

**Open Back**

## *Inclinable Power Presses*



Sturdily constructed, simple throughout, easily operated.

They produce a maximum output and show no appreciable wear after years of severe, continuous service.

The capacity is almost unlimited for blank cutting, forming, perforating, drawing, shaping and combination die work.

Many exclusive features are of the greatest advantage for speeding up the work and reducing cost.

**20 sizes, from 350 to 15,000 lb.**

**The Toledo Machine & Tool Co.**

**Toledo, Ohio**

OVER-SEAS REPRESENTATIVE

ALMACOA ALLIED MACHINERY COMPANY OF AMERICA ALMACOA
120 BROADWAY, NEW YORK, U.S.A.

Paris, Turin, Zurich and Barcelona

# Beaudry Hammers

FOR

## General Forging

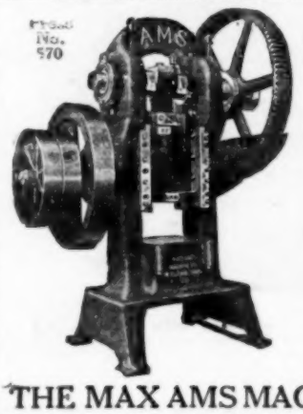
Save Fuel, Time and Labor. Cut Forging Costs in Two.

**Belt or Motor Driven.**

**Beaudry & Co., Inc.**

**141 Milk Street**

**BOSTON, MASS.**




# PRESSES

**Large or small**
**Regular or Special**

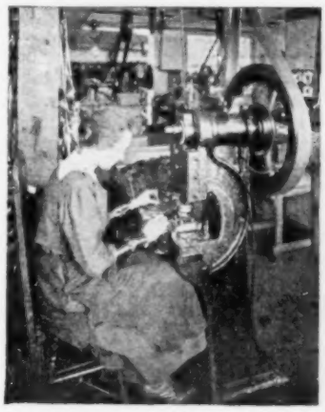
**The last word in Presses is**

# "AMS"

Look for it.

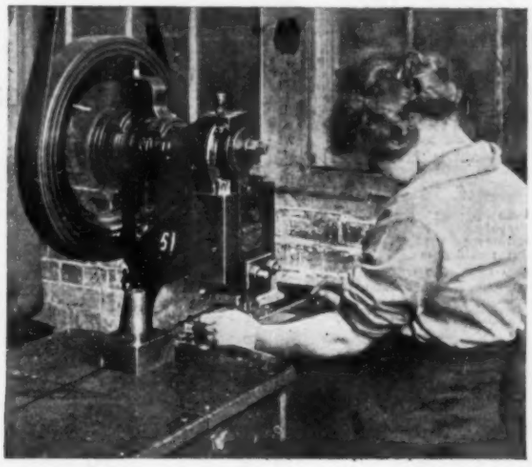
It's your security.

**THE MAX AMS MACHINE CO.,** BRIDGEPORT CONN., U.S.A.

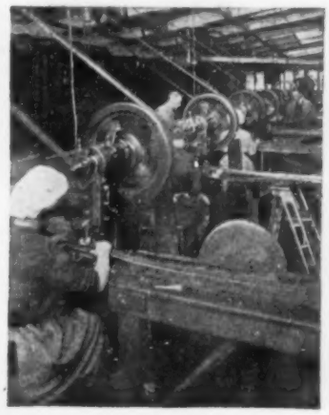


STILES Press forming blanks already produced.

Below: A heavy STILES Press blanking from strip stock showing staggered method.



A STILES Press that had just cleaned up its job and was ready for a new one.



Battery of STILES Presses blanking from strip stock.

Below: STILES Press equipped with roll feed. Evidently a fast producer.

# "BLISS" STILES TYPE PRESSES

in the plant of the Greist Manufacturing Co., New Haven, Conn. Said our Sales-manager: "Our advertising has been short on Stiles Presses." Perhaps—yet there are plenty about, and they are uncommonly busy, blanking, punching, forming and bending, as these photos show. Perhaps there exist in your plant some special reasons why Stiles Type Presses should be installed.

BLISS 1857

## E. W. BLISS COMPANY

*Main Office and Works: BROOKLYN, N. Y., U. S. A.*

CHICAGO OFFICE Peoples Gas Bldg.

DETROIT OFFICE Dime Bank Bldg.

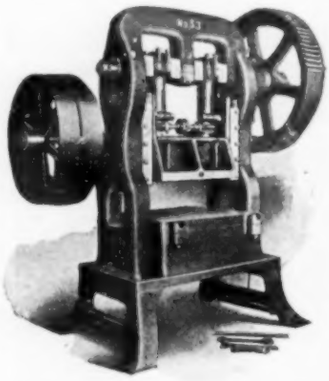
CLEVELAND OFFICE Union Bank Bldg.

BLISS 1919

LONDON, S. E., ENGLAND, Pocock St., Blackfriars Road

PARIS, FRANCE, 100 Boulevard Victor-Hugo St. Ouen

No. 2.



## Open Side Construction

The Open Side Construction of the V & O Straight Sided Presses is a very important feature. It permits the feeding of stock from front to back or from side to side.

The frame is held rigid by the wide base of the uprights. Greater accuracy in production is a result.

These presses are especially adapted for heavy blanking, forming, perforating, trimming, drop forging, etc.

Made in 8 standard sizes, plain and geared, single and double crank.

*Bulletin A-50 gives details.*

**The V & O Press Co.**
Glendale, Brooklyn, N.Y.

## "ERIE" Steam Hammers

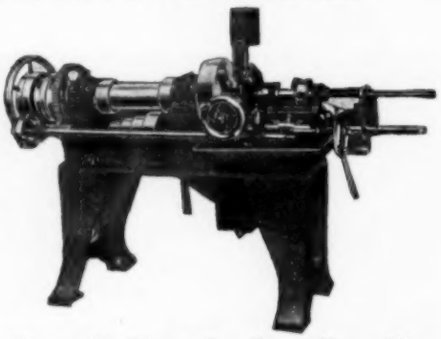
***For Either Air or Steam Operation***

**Single Frame—Double Frame or Steam Drop Hammers.**

**ERIE FOUNDRY COMPANY**
**Erie, Penna., U. S. A.**

## Doubles Production

**Two Tools one cuts up and one down; double the work in cutting off.**



**The Hurlbut, Rogers Machinery Co., So. Sudbury, Mass.**

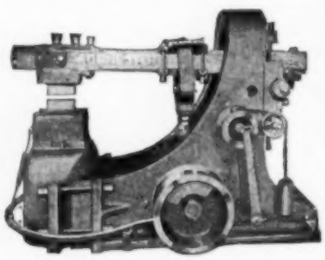
**Advantages Galore in the**
## "LITTLE NIAGARA"
**Machine Tool Lubricant Pump**

Never needs priming.
It can't clog.
Needs no check valves.
No sliding blades.
Gears never bother—hasn't any.
No springs and only one moving part—the rotor.
A "pep" pump that puts plenty of coolant right where it belongs.
Send for details today.

Patented August 18, 1918
Patented December 17, 1918

**Hudson Pump Co., Inc.**
**Jersey City, N. J., U. S. A.**

## Put On Your Searchlight



**We Have a Rochester Helve Hammer For You—**

**8 Sizes**
**2 Style Frames**

*Send for the Helve Hammer Book*

**The West Tire Setter Co.,** ROCHESTER, N. Y.

## PRESSES and SHEARS

**Sheet Metal Working Machinery**

**THE D. H. STOLL CO., Inc.**
**Military Road & Lansing St., Buffalo. N.Y.**

## FERRACUTE PRESSES

HUNDREDS OF SIZES AND STYLES

FOR CUTTING, FORMING, PUNCHING, DRAWING AND EMBOSSING BAR AND SHEET METALS, PAPER, LEATHER ETC.

FERRACUTE MACHINE CO., BRIDGETON, N. JERSEY, U.S.A.

## Lea-Simplex Cold Saw

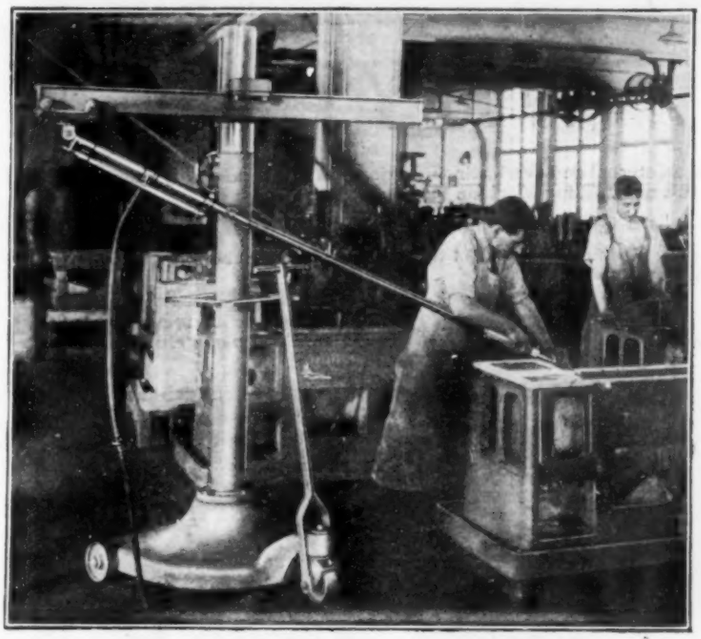
***—the cost is surprising in view of its speed***

**The Earle Gear & Machine Co.**
4701 Stenton Ave., Philadelphia

## ATLAS Presses

There is nothing to offset the saving when you invest in an Atlas Press. You get two presses for the cost of one when you install Atlas Presses. Write for the Atlas Bulletins.

**Atlas Press Co., 317 N. Park St., Kalamazoo, Mich., U. S. A.**



# The Modern Way of Scraping

A machine with the "human touch"; it scrapes at any angle. And with practically no hard labor on the part of the operator. The power is pneumatic—applied by slight pressure on a sensitive valve control. Releasing the pressure stops the stroke and brings scraper back to original position. The

# ANDERSON
## Pneumatic Scraper

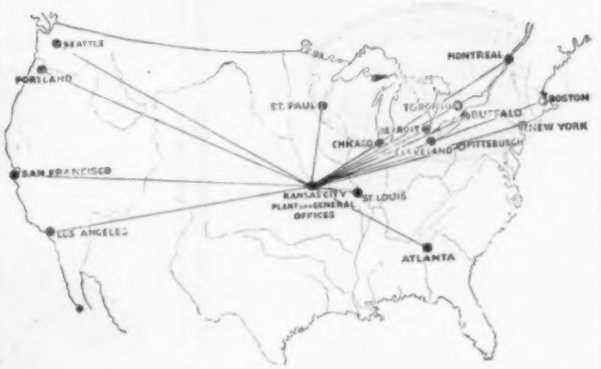
is truly a boon to the shop where considerable scraping is done. If you have scraping work for 3 men you need the ANDERSON. If you want your men to stick to you—to earn better money for themselves and keep your costs down at the same time you need the ANDERSON Pneumatic Scraper.

***Shall we give you details?***

**Anderson Bros. Mfg. Co.**

**120 Morgan St., Rockford, Ill.**

# A National Institution




We have established throughout the United States and Canada branch offices in all of the principal cities, with the view of giving more careful attention to the requirements of our many friends and to provide them with proper service.

Every executive charged with the task of securing maximum results at a minimum of cost knows, in choosing pneumatic tool equipment at least, three important factors should enter into the decision—the selection of good tools with due regard to their lightness of construction to provide portability—economical air consumption properly used—and maximum results secured through efficient designing, assembling and the proper functioning of all wearing parts, thus reducing the cost of upkeep for repairs.

We are manufacturers of high-class pneumatic tool equipment, designed to meet the most rigid tests for economy, efficiency, durability and dependability under any and all conditions of service, because every tool is

## "Built For The Job"

Baird Pneumatic Tools include:

- Compression Lever Riveters
- Truck Tank Frame and Girder Riveters
- Oil Burning Furnaces
- Staybolt Cutters
- Lattice Yoke Riveters.
- Auto Frame Riveters
- Portable Rivet Forges
- Arch Flue and Pipe Bending Machine

**BAIRD**

## Pneumatic Tool Company

General Sales Offices

**Rialto Bldg., Kansas City, Mo.**

**BRANCH OFFICES:**

| | | | |
|---|---|---|---|
| New York | 50 Church St. | St. Paul | 606 Pioneer Bldg. |
| Boston | 259 Franklin St. | St. Louis | 957 North Broadway |
| Pittsburgh | 217 Stanwix St. | Los Angeles | 241 S. Los Angeles St. |
| Detroit | 1430 Penobscot Bldg. | San Francisco | 71 First St. |
| Cleveland | Citizens Bldg. | Portland | 46 Front St. |
| Buffalo | 881 Ellicott Square | Seattle | L. C. Smith Bldg. |
| Chicago | 549 W. Washington St. | Atlanta | Broad & Hunter Sts. |

**Canada:**

Montreal, 327 St. James St.; Toronto, 131-45 Front St. W.

**Foreign Sales Offices:**

New York, 50 Church Street.

HARTFORD SPECIAL
*The Shop of a Hundred Experts*
MACHINERY COMPANY

# WHY?

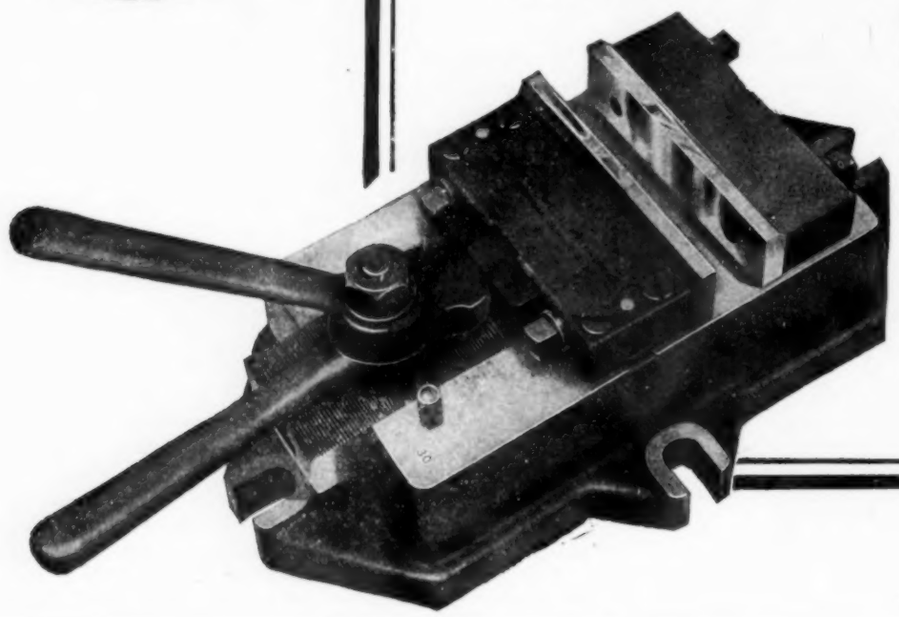
"Why" is an eternal and everlasting question. In this case—Why should a man use this new Milling Machine Vise?

Because it is a quality vise which will last longer than the average.

All parts are made of special steel with the exception of the base, which is of special iron.

All working parts are steel drop forgings. Fitting surfaces are ground and parts are interchangeable.

Investigate—you can use a high quality vise. Write us today before you forget.



**The Hartford Special Machinery Co.**
280 Homestead Ave.
Hartford, Conn.

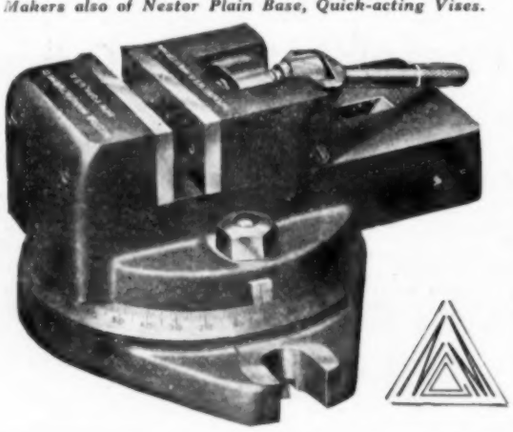
# HERE IS THE QUICK ACTING NESTOR VISE

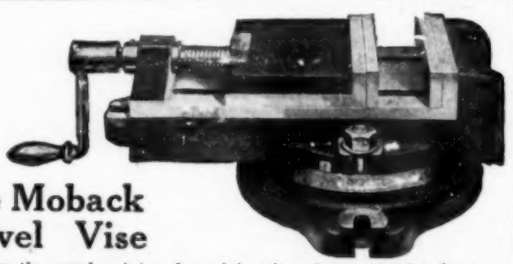
## WITH SWIVEL BASE

It will answer satisfactorily every demand on milling and drilling jobs. The base is graduated to aid operators in accuracy.

*Made in four sizes. Send for details.*

**NESTOR MANUFACTURING CO., Inc.**
40 W. 13th St., New York City
*Makers also of Nestor Plain Base, Quick-acting Vises.*





## The Moback Swivel Vise

combines the good points of a plain vise plus a circular base graduated in degrees. The vise can be taken off the base and used plain if desired. Also has cross-slots and side ears, and the jaws are hardened and ground. Sizes 4 to 8 in. **Let us send particulars.**

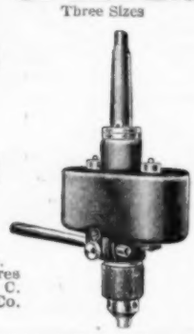
**Moback Tool & Machine Mfg. Company**
330 Atlantic Ave., Boston, Mass.
**Foreign Agents**—Alfred Herbert, Ltd., Coventry, England; Milan, Italy; Yokohama, Japan; and Calcutta, India.

**KNURL HOLDER**

Two Sizes
**For Turret Machines**
Adjustable to knurl all work up to 2½-in. diameter.

**Foreign:**
France, Italy, Spain, Holland: Fenwick, Freres & Co. Great Britain: C. W. Burton, Griffiths & Co.

High Speed Drilling Attachment or
**DRILL SPEEDER**
Three Sizes



**DRILL VISE**

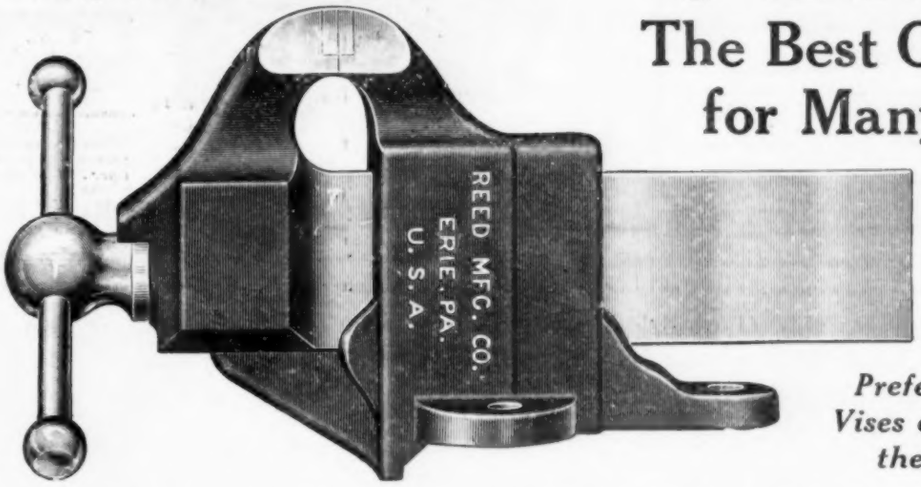
Three Sizes
**With and Without Jig Attachments**
Often used on miller, shaper or planer.

Send for circulars.

**The Graham Mfg. Co.**
**Providence, R. I.**

# REED VISES

## The Best Obtainable for Many Years




**Reed Vises are strongest and last longest**

***Preference for Reed Vises comes only from their superiority***

**Rigidity**—due to design, weight and careful making, Reed Vises are the most Rigid. Work performed on an object held in a Reed Vise is delivered to that object and not wasted through springing of the vise and recoil.

*Send for catalog and folder "The Primary Function of a Vise."*

**REED MANUFACTURING CO., ERIE, PA.**

# Features that no other Vise has

**Make the "Starrett" the best**

The swivel base and non-slipping handle are only two of the patented features of the Starrett Improved Vise which make it the most convenient time-saving vise for your shop.

Why not let us send our booklet "Something New in Vises"; it describes the many superior features of the "Starrett."

**ATHOL MACHINE COMPANY, Athol, Mass., U. S. A.**

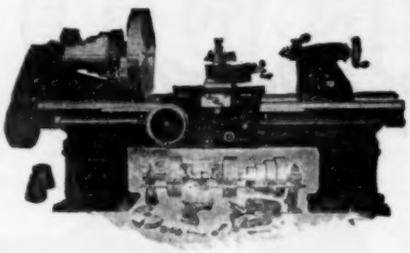
30 in. 24 yd. rolls, $12.00
36 in. 24 yd. rolls, 13.00
42 in. 24 yd. rolls, 16.00

We now have manufactured especially for us a tracing cloth that will compare favorably with any in the market. The surface is of the best. It takes ink perfectly. It is tough. Its transparency is high. Its erasing qualities equal any. And the Price!

Get our prices on cut sheets, printed with border and title. *Send for sample.*

SPAULDING-MOSS COMPANY
34 Federal St., Boston, Mass.

## SOUTH BEND LATHES



Made in six sizes, 13-in., 15-in., 16-in., 18-in., 21-in. and 24-in. swing, with beds from 4 ft. to 16 ft. in length. Straight or gap bed.

*Have been on the market 13 years; over 20,000 in use*

Send for New Catalog No. 57

**South Bend Lathe Works, South Bend, Ind.**
422 E. Madison Street

## Increase the Capacity of Your Drill Presses

Equip them with Hayes Quickgrip Table Vises and when opened you have a drill press table 16 ft. x 24 in., and the only one made which will allow work to run down below the face of the table to the base of press.

### Quickgrip Table Vises

will save you many broken drills and much spoiled work. They grip the work firmly and instantly in the proper position. There can be no twisting under the drill nor is it ever necessary to hold the work by the hands. Will fit any drill press.

*Write for particulars.*

**Sprague-Hayes Machinery Company**
44 E. Larned St., Detroit, Mich.

## Tool Chests

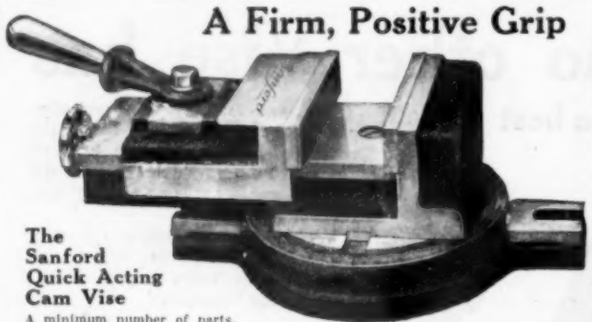
Our chests are the strongest, best and most up-to-date of any on the market.

*The only chest made of 3-ply veneer.*

**J. M. Waterston**
83 Woodward Ave.
Detroit, Mich.

*Write For Catalog*

## A Firm, Positive Grip

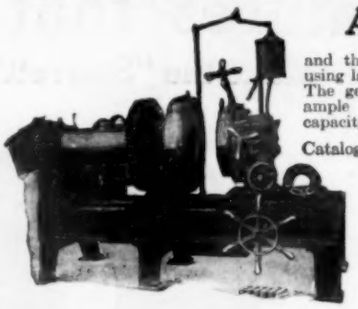


**The Sanford Quick Acting Cam Vise**

A minimum number of parts, simple in design, speedy in adjustment and positive in its grip. These are features looked for in a swivelling vise. Sanford Quick Acting Vise and Swivel—each an independent tool in itself—gives an operator unlimited confidence. Send for folder giving details of Sanford Vises.

**The F. C. Sanford Mfg. Company, Bridgeport, Conn., U. S. A.**

## The Power Lies in the Gearing Arrangement



and thus avoids the necessity of using large pulleys and tight belts. The gears and cone pulleys give ample changes of speed for the capacity of the machine.

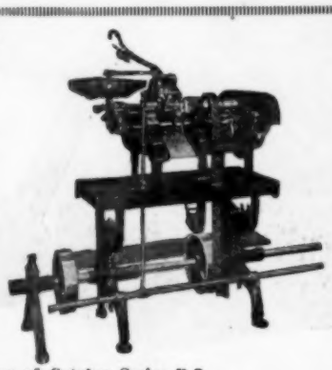
Catalog "M" describes this Improved Pipe-Threading and Cutting Machine with Adjustable Expanding Die-Heads, with Interchangeable Chasers.

*Write for a copy.*

**D. Saunders' Sons. Yonkers, N. Y.**

## Wood Screw Plant Equipment

We make a specialty of furnishing machinery and equipment for wood screw plants, consisting of Headers, Shavers, Slotters, Threaders, Pointers, etc. Our illustrated catalog No. 25 describes our machines fully and contains valuable suggestions for those planning the manufacture of wood screws.



**Write for a copy of Catalog Series B-3**

**THE ASA S. COOK CO.** 605 FRANKLIN AVENUE HARTFORD, CONN.

## Anderson Die Forming Machine →The Cutter Revolves←

The distinctive form of cutter follows practically any contour. In finishing blanking dies and similar work, a single cutter can complete the piece after the core has been drilled.

That is one reason for greater speed and economy than the ordinary reciprocating filing machine. And there are many other unusual features in these tools.

**Bulletin No. 6 gives complete details. Write for it.**

**ANDERSON DIE MACHINE COMPANY**
BRIDGEPORT, CONN., U. S. A.

# BARKER WRENCHLESS CHUCKS

## *Always Increase Production*

THE BARKER WRENCHLESS CHUCK ***always*** means speed and increased production.

It performs all of the chucking operations instantaneously, and devotes all of the time saved to more production.

A pull of the lever operates the jaws and chucks the piece.

The jaw pressure is always under the control of the lever, whether the chuck is in motion or not, and may be instantly increased or decreased at will.

Its grip is secured by a newly applied system of compounding leverage which is beyond comparison for power of jaw pressure.

It is self-centering to the finest degree, it permits bar work to spindle capacity and has many other exclusive advantages.

It is in daily operation in hundreds of the best-known shops in the country. It has *never failed* to increase production.

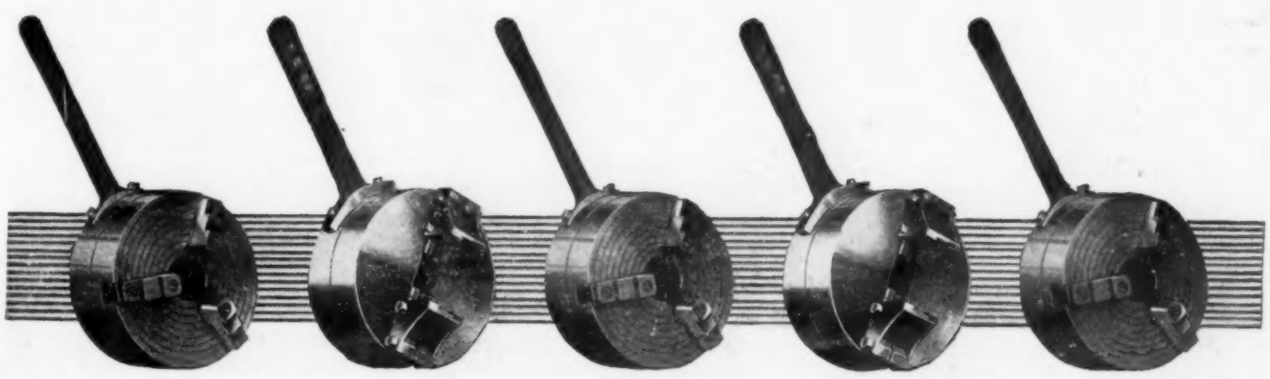
Sizes 6 to 16 inches. Send for booklet "WRENCHLESS CHUCKING" with full particulars, prices and illustrations of mechanism.

## THOMAS ELEVATOR COMPANY

*Chuck Division*

27 South Hoyne Avenue
CHICAGO

328 Park Row Building
NEW YORK



TC-21

# Drive your High Speed Drills to their limit without slipping

The Horton Morrow Drill Chuck is one of the best known of all hand-operated chucks. It is a ball-bearing, self-tightening automatic grip chuck that drives high-speed drills without slipping. No key or spanner required. All important parts *hardened* and *ground*.

Five sizes, taking drills from 0 to 1″.

*Write for Catalog No. 16, just off the press*

## The E. Horton & Son Co.

Windsor Locks, Conn., U. S. A.

# TROUBLE? – NEVER!

Not when you use *"D & W" Magnetic Chucks.* That's what users will always tell you. Ask them and be convinced.

You will find that there is no trouble in *gripping.* No trouble in *letting go.* No trouble from oils, heat, water and other adverse conditions. No trouble in producing accurate work. No trouble in speeding up the men's output and cutting the cost. If *you* want to eliminate trouble the same way—look in Circular 206-A. It'll tell you how!

## D & W FUSE CO., Providence, R. I.

# *Odd, Isn't It*

—that some people think of advertising as a means of benefiting only the seller, when its basic function *must be* to render a necessary service to the buyer, else it could not exist. Merchandise lives or dies as it does or does not meet a human need. Advertising is subject to the same law of service. The real measure of its value is what it *gives,* not what it gets.

In the light of these truths, the marvellous growth of advertising in itself is an impressive demonstration of its essential character in our economic system.

But you are not interested in *all* advertising any more than you are in all merchandise. That is one big reason why you have a highly specialized Business Paper in your field such as the one carrrying this advertisement. It was born of your needs, not of any man's desire to be a publisher.

### *How It Works for You*

What is does for you and your field editorially is self-evident, but its *ad*itorial service is just as vital. Instead of a buyer having to depend upon gossip, hearsay and driblets of information from this or that source, he gets it all between two covers.

Timely, authoritative, comprehensive statements about needed materials pass in review as the advertising pages are turned. Confident judgments can be formed and intelligent decisions made.

Yet advertising is NOT an *added* expense, but an improved distributive process which takes the place of slower, more costly and less efficient methods.

That is why it pays to *read* advertising even more than it pays to advertise. Especially if you read it in papers which have met the exacting requirements of membership in The Associated Business Papers, Inc., for one of its standards of practice requires that a paper must *decline any advertisement which has a tendency to mislead or which does not conform to business integrity.*

***You are invited to consult us freely about Business Papers or Business Paper advertising***

**LIST OF MEMBERS**

*Each has subscribed to and is maintaining the highest standards of practice in their editorial and advertising service.*

Advertising and Selling
American Architect
American Blacksmith
American Exporter
American Funeral Director
American Hatter
**AMERICAN MACHINIST**
American Paint Journal
American Paint and Oil Dealer
American Printer
American School Board Journal
Architectural Record
Automobile Dealer and Repairer
Automobile Journal
Automobile Journal

Bakers Weekly
Boot and Shoe Recorder
Brick and Clay Record
Buildings and Building Management
Building Supply News
Bulletin of Pharmacy

Canadian Grocer
Canadian Railway and Marine World
Candy and Ice Cream
Chemical & Metallurgical Engineering
Clothier and Furnisher
Coal Age
Coal Trade Journal
Concrete
Cotton

Daily Iron Trade & Metal Market Report
Domestic Engineering
Dry Goods Economist
Drygoodsman
Dry Goods Reporter

Electric Railway Journal
Electrical Merchandising
Electrical Record
Electrical Review
Electrical World
Embalmer's Monthly
Engineering World
Engineering and Mining Journal
Engineering News-Record

Factory
Farm Machinery—Farm Power
Foundry (The)
Furniture Journal
Furniture Manufacturer and Artisan
Furniture Merchants' Trade Journal

Gas Age
Gas Record
Grand Rapids Furniture Record

Haberdasher
Hardware Age

**LIST OF MEMBERS**

*(Continued)*

Heating and Ventilating Magazine
Hide and Leather
Hotel Monthly

Illustrated Milliner
Implement and Tractor Age
Industrial Arts Magazine
Inland Printer
Iron Age
Iron Trade Review

Lumber
Lumber Trade Journal
Lumber World Review

Manufacturers' Record
Manufacturing Jeweler
Marine Engineering
Marine Review
Metal Worker, Plumber and Steam Fitter
Mining and Scientific Press
Millinery Trade Review
Mill Supplies
Modern Hospital
Motor Age
Motorcycle and Bicycle Illustrated
Motor Truck
Motor World

National Builder
National Druggist
National Petroleum News
Nautical Gazette
Northwestern Druggist
Nugent's, The Garment Weekly

Power
Power Boating
Power Plant Engineering
Price Current—Grain Reporter

Railway Age
Railway Electrical Engineer
Railway Maintenance Engineer
Railway Mechanical Engineer
Railway Signal Engineer
Retail Lumberman
Rubber Age

Shoe Findings
Shoe and Leather Reporter
Shoe Retailer
Southern Engineer
Southern Hardware and Implement Journal
Sporting Goods Dealer
Starchroom Laundry Journal

Tea and Coffee Trade Journal
Textile World Journal
Timberman
Transfer and Storage
Twin City Commercial Bulletin

Woodworker

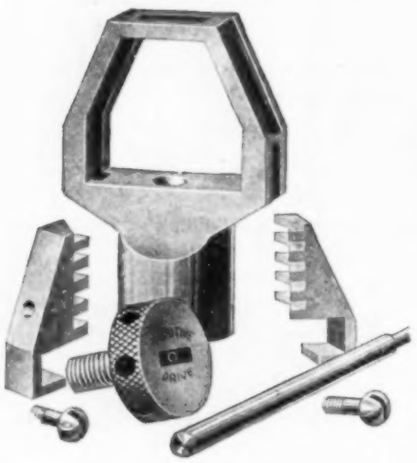
## THE ASSOCIATED BUSINESS PAPERS, INC.

JESSE H. NEAL, Executive Secretary

**HEADQUARTERS: 220 West 42nd Street NEW YORK CITY**

# PRATT ONEIDA Skeleton Drill Chuck

THE PRATT CHUCK CO. FRANKFORT N.Y.



## Most Efficient for Use

### When Drilling Brass, Bronze, Aluminum, Etc.

This is the drill chuck you want for your small difficult drilling jobs which create fine chips or dust.

Its design is very simple, all parts being exposed and easy to clean.

The projecting jaws of this chuck allow short or broken drills to be used. The positive self-tightening drive eliminates slippage with its power loss and scoring of drill shanks.

We also manufacture the Pratt Oneida Positive Drive Drill Chuck and Steel Re-inforced Lathe Chuck as well as a complete line of other chucks for all purposes. Write for descriptive catalog.

**The Pratt Chuck Company**
**Frankfort, New York**

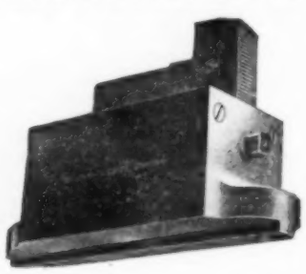
***Manufacturers of Good Chucks for 25 Years***

New York Sales Office and Stockroom: 39 Cortlandt St., N. Y. City.
Chicago Sales Office and Stockroom: 557 W. Monroe St.
European Representative for England, France, Italy and Australia: The Selson Engineering Co., 83 Queen Victoria St., London.
Russia: The M. Mett Engineering Co., Ltd., Petrograd, Russia.

***Makers of Good Chucks for Over Twenty-five Years***

# SKINNER

BORING MILL JAWS



**With Double Ribs**

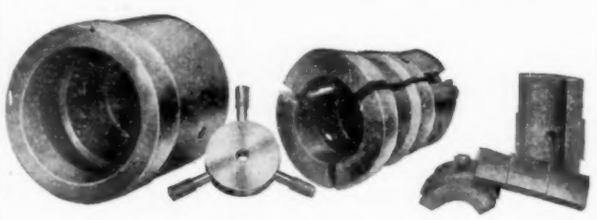
The Boring Mill Jaws are furnished with double ribs being used on Boring Mill Tables and Lathe Face Plates where there are parallel slots usually six inches center to center. Jaws can be altered for different widths of Ribs and spacing when desired. (Extra charge is made to cover alterations.)

The Iron Body Jaws will be found entirely satisfactory under all ordinary conditions of general manufacturing. Where the work is unusually severe, requiring Jaws suitable for the heaviest work and hard usage, we recommend the Steel Body Jaws.

The Adjustable Jaws are reversible and are made of Steel carefully hardened.

**The Skinner Chuck Company**
**Main Office and Factory, New Britain, Conn.**

New York Office: 94 Reade Street. San Francisco Office: Rialto Bldg. London Office: 139 Queen Victoria St.



# For a Certain Grip on Irregular Work

THIS Parallel Grip Collet Chuck holds work the full length of the gripping surface regardless of variation up to ¼ in. in size of taper.

The advantage of this collet over chucks in which the entire length of gripping surface is available only when the work is uniform, is at once apparent.

All parts subject to wear are hardened and ground. Regular equipment includes Master Jaws with open rear ends.

False Jaws, either blank or shaped to the work are furnished.

Made regularly with three jaws but can be furnished with two or four—maximum capacities of 2 in., 3 in., 4 in. and 6 in.

We manufacture Standard and Special Air Operated Gripping Devices and Air Cylinders.

**American Pneumatic Chuck Co.**
**9 South Clinton Street, Chicago**

**Detroit: 2 Goebel Bldg.**
**Representatives—Eastern Machinery & Equipment Co., Philadelphia, Pa. James Buckley Co., Montreal, Canada. Geo. H. Alexander, Birmingham, England. Aux Forges de Vulcain, Paris, France.**

# Yesterday—Today—Tomorrow

Time makes no noticeable impression on a Sweetland Chuck. The chuck in use today by many a veteran mechanic is often-times found to be the one he used during his apprenticeship. The same tenacity of jaw grip is as noticeable today as it was in yesteryear and tomorrow will find no change. The body is scientifically ribbed to prevent buckling or spring under severe strain. In fact, one part of a Sweetland backs up the other and all combine to hold the repute they have gained for their makers.

***Our literature will show you how to boost your production. Don't fail to send for it***

**The Hoggson & Pettis Mfg. Co.**
**New Haven, Conn., U. S. A.**

SWEETLAND CHUCKS

# CUSHMAN 2-Jaw Chucks

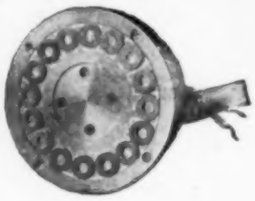
are useful on work where 3-jaw and 4-jaw Chucks are impracticable. They'll hold small pieces as well as large ones, and they'll stand up under hard service.

The jaws are reversible, large, carefully fitted and hardened. Cushman 2-jaw Chucks are as good as our more familiar models. We couldn't say more than that.

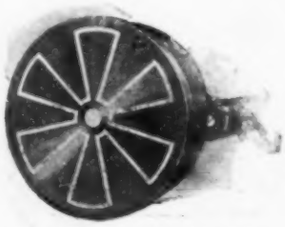
**THE CUSHMAN CHUCK COMPANY**
**Hartford, Conn.**

# THE WALKER LINE

## A Snap of the Switch Secures the Work



With a Walker Chucky ou simply lay the work on the chuck, snap the switch and the machine is ready to start—your parts are held by a firm positive magnetic grip.



### The Walker Magnetic Chuck

will fit almost any machine—none are too large and few are too small.

Send for our chuck bulletins; also those of our grinding machines.

**O·S·Walker Co·**
**Worcester·Mass·**
*Successors to O·S·Walker & Co·Walker-Grinder Co.*

# They never let go

## Ellison Drill Chucks

The geared hand wrench and geared sleeve make it possible to tighten up the jaws mechanically so that they hold with a vise like grip. No such grip is possible with a purely hand tightening chuck. This unusual grip means no slipping of drills and no consequent burring up and marring of the shanks. This means drill economy.

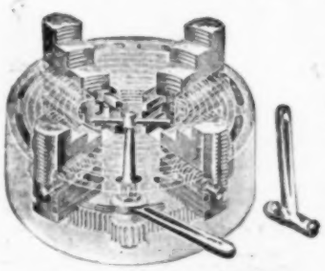
To preserve the correctness in design we use the highest quality material and workmanship on every individual chuck.

Your money refunded if you are not satisfied expresses our supreme confidence and pride in our product.

Our descriptive circular, sent on request, will give you details as to capacities and prices of these mechanically right chucks.

**The American Machine Co.**
104 Wellington Avenue, Hartford, Conn.

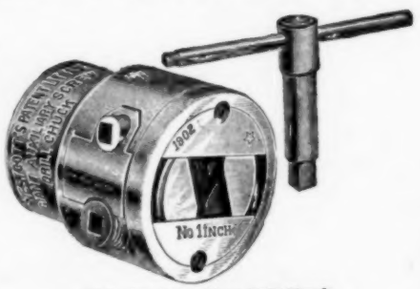
# If You Want The Best Lathe And Drill Chucks—Buy WESTCOTT



Spur Geared Scroll Combination Lathe Chuck

Little Giant Auxiliary Screw Drill Chucks, Little Giant Double Grip Drill Chucks, Little Giant Improved Drill Chucks, Oneida Drill Chucks, Spur Geared Scroll Combination Lathe Chucks, Scroll Combination Lathe Chucks, Geared Combination Lathe Chucks, Geared Universal Lathe Chucks, Spur Geared Scroll Universal Lathe Chucks, IXL Independent Lathe Chucks, Cutting-off Chucks.

**Strongest Grip, Greatest Capacity, Great Durability, and Accurate.**



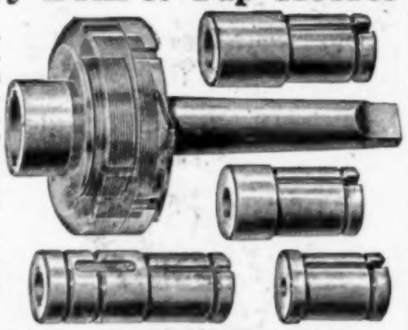
Little Giant Auxiliary Drill Chuck.

**WESTCOTT CHUCK COMPANY, ONEIDA, NEW YORK, U. S. A.**

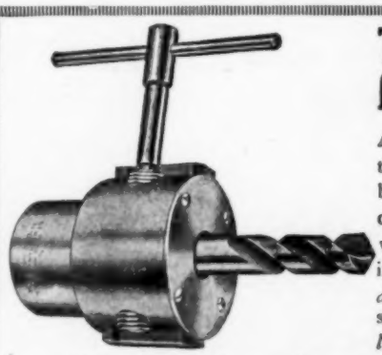
# The Safety Drill & Tap Holder

**is the only attachment for the purpose that gives universal satisfaction and is Unequaled for Efficiency, Convenience, Rapidity, Accuracy and Simplicity.**

Nothing to *break or get out of order.* Made in 4 sizes covering from 0 to 2¼ in. diameter



**The Beaman & Smith Co., Providence, R. I., U. S. A.**
Builders of Boring and Milling Machines, and Special Machines for such Purposes Constructed



# The Union Drill Chuck

A strong and substantial chuck—made of best materials, and a chuck that will wear well under severe service. Also has a *positive drive* feature that will save drills and insures *long life to the chuck.*

**Union Manufacturing Co.**
26 Cortlandt St., N. Y. NEW BRITAIN., CONN., U.S.A.
Makers of a Complete Line of Chucks

# ALMOND

UNIVERSAL GEARED SCROLL LATHE CHUCK

The one-piece body eliminates parts and prevents chattering when under cutting pressure.

The Jaws are made of special alloy steel and hardened through making them stronger than the usual case-hardened Jaws. Two styles of Jaws No. 1 Common Jaws, No. 2 Reverse Jaws.

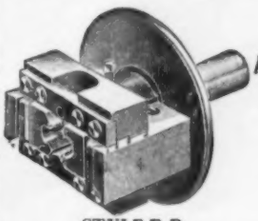
OTHER **ALMOND** PRODUCTS

**Drill Chucks, Right Angle Transmission, Micrometer Calipers, Flexible Steel Tubing**

**T. R. ALMOND MFG. CO.**

**Ashburnham, Mass.**

# A SOLID DIE WHILE CUTTING, YET OPENS AUTOMATICALLY



STYLE F-B

**Adjustable Gib Slide Assures PARALLEL THREAD Closer to Shoulder than Any Other Opening Die**

400 half-inch Steel Conduit Connectors **per hour,** cut with **Errington Style "F-B" Rotary Die Head,** after having been adapted for the above work by our Engineering Department. This work has parallel pipe straight thread cut right up to shoulder.

The "Errington" is not only "The Simplest Die That Opens," but the only die that opens and closes while rotating; that can be used on Drill Press, Engine Lathe or Turret Lathe; a Special Tool on each job, yet easily adapted to General Work.

Twenty Years' Special Engineering Experience back of each tool to help make a record on your work.

*Give us a trial.*

**ERRINGTON,** 41 Cortlandt Street, New York City
136 W. Lake Street, Chicago

Catalogue Francais: Edgar Bloxham, Paris, 12 Rue du Delta.

# For Quicker Milling

With the Wear-Ever Adjustable Spacing Collar you can shift from one milling job to the next almost immediately. Simply shift the collar on the spindle, turn to the proper adjustment, attach the cutter and start work. Everything ready in an instant and much more accurately than could ever be possible by the old time-wasting method of cutting paper shims.

Wear-Ever Collars are provided with adjustments in increments of .002 in. over a range of .024 in. They are as solid as any one-piece collar ever made their faces are always true and parallel, and there is absolutely no danger of their ever slipping.

Write us for descriptive booklet and complete information at once.

**Scully-Jones Company**
**649 Railway Exch. Bldg.**
**Chicago**

"Wear-Ever"

*Adjustable Spacing Collar*

# Are You Drilling the Expensive Way?

Are you using taper shank drills ½ inch and under when they cost 40 to 60 cents more than Jobbers straight shank drills? With the **ETTCO Hand-Operated, Self-tightening Drill Chuck** you can do away with this unnecessary expense. The ETTCO will hold the cheaper straight shank drills absolutely without slip. Its design and construction is such that the action of drilling mechanically tightens the jaws.

***Write today for booklet. It gives full details of the Positive Grip***

# ETTCO

**Eastern Tube and Tool Company, Inc.**

***Offices:***
**594 Johnson Ave.**
**Brooklyn, N. Y.**

***Factory:***
**41-59 Gardner Ave.**
**Brooklyn, N. Y.**

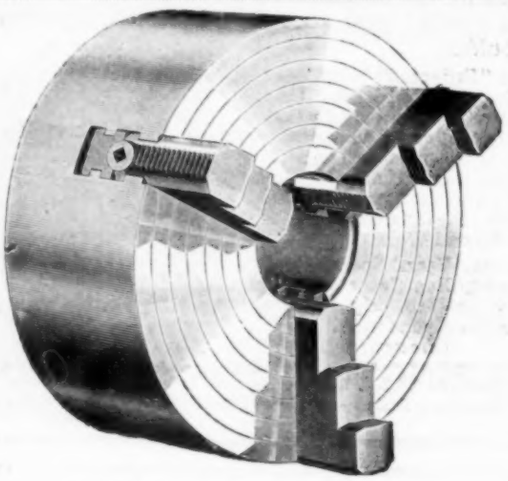
# ELIMINATES SLIPPING DRILLS

***The WAHLSTROM Automatic Drill Chuck***

Three cylindrical jaws operate on cams—the greater the drill resistance the tighter the jaws grip—drills can't slip—this together with the automatic feature which enables you to change tools instantly without stopping the drill press—will increase your production.

***Full details and prices upon request***

**The Wahlstrom Tool Company**
**5520 Second Avenue, Brooklyn, N. Y.**



## Solid—No Joints to Crack or Break

The Whiton Geared Scroll Chuck is the only chuck on the market made in one solid piece without joints. Can be made either Universal or Independent, and each jaw is reversible and independently adjusted.

**Our Catalogue is more explicit.**

**D. E. WHITON MACHINE CO.**
**New London, Conn.**

Europe: Selson Engineering Co., Ltd., 85 Queen Victoria St., London, E. C.

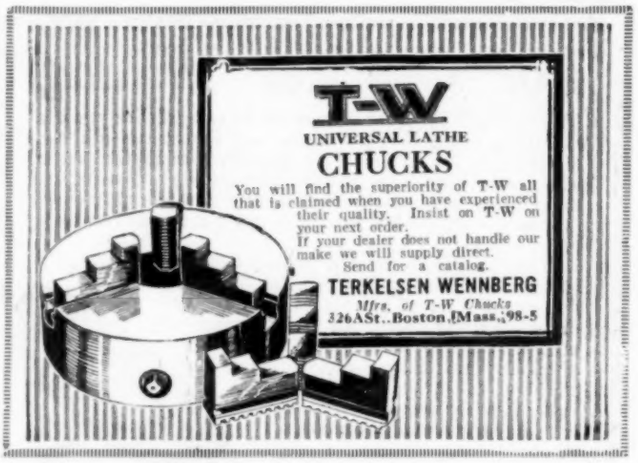
***"Whiton" Chucks are sold and kept in stock by principal dealers all over Europe***

## 4 Reasons Why

you should use a "Woodstock" Improved Safety Tapping Chuck. 1st. Practically impossible to break a tap no matter how tough the operation. 2nd. They will work to full length of the tap or where threads are only one or two deep. 3rd. Made with or without Automatic Reversible Attachment. 4th. Sent on 30 days' free trial. New illustrated descriptive literature absolutely free and no obligation incurred.

**PETER BROS. MFG. CO.**
**ALGONQUIN ILLINOIS**

Messrs. A. A. Jones & Shipman, of Leicester, England, L'Outillage Mecanique, 16 Rue Dupont, De L'Eure, Paris, France, carry a complete line of these chucks.



**T-W**
**UNIVERSAL LATHE CHUCKS**

You will find the superiority of T-W all that is claimed when you have experienced their quality. Insist on T-W on your next order.
If your dealer does not handle our make we will supply direct.
Send for a catalog.

**TERKELSEN WENNBERG**
*Mfrs. of T-W Chucks*
326 A St., Boston, Mass., 98-5

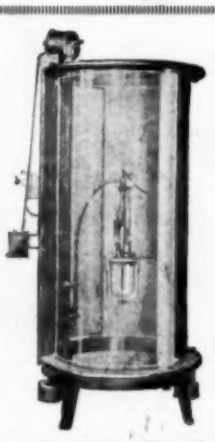
**BLUE PRINTS**

Day or Night - Rain or Shine - up to 48" in width and of unlimited length by

**THE WICKES CONTINUOUS ELECTRIC**

Is Economical Production with a snap to it. Sells at half the price - operates at half the cost of others. A world wide list of enthusiastic users is most convincing.

**WICKES BROTHERS**
**SAGINAW-MICHIGAN-U.S.A.**



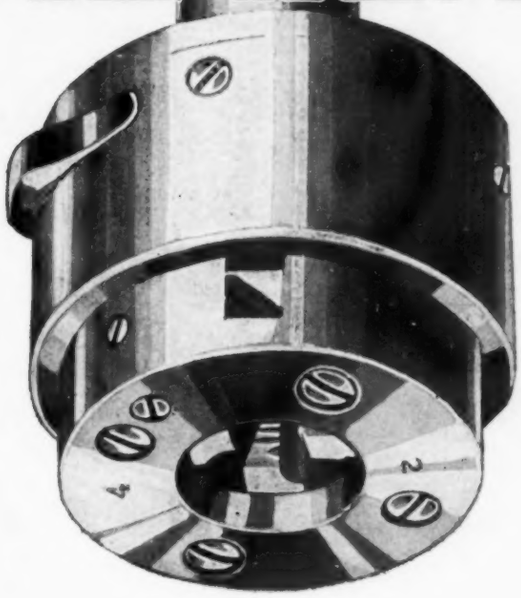
**Electric Blue Printing Machines**

***Write for Catalog B-3***

**Buckeye Engine Co.,**
**Salem, Ohio**

# H&G

## Automatic Self Opening DIE HEAD



# *Slicker'n Grease*

That's the way a friend of mine expressed his delight at the H & G.

Now I just happened to know that grease is mighty slick stuff and so I asked him to elaborate.

"Well," says he, "here's a die head that cuts straight and true threads—never taper threads; that cuts to a given point and to a shoulder every time, that will cut over or under standard when desired; one that eliminates varying sized threads and one that is easily adjusted."

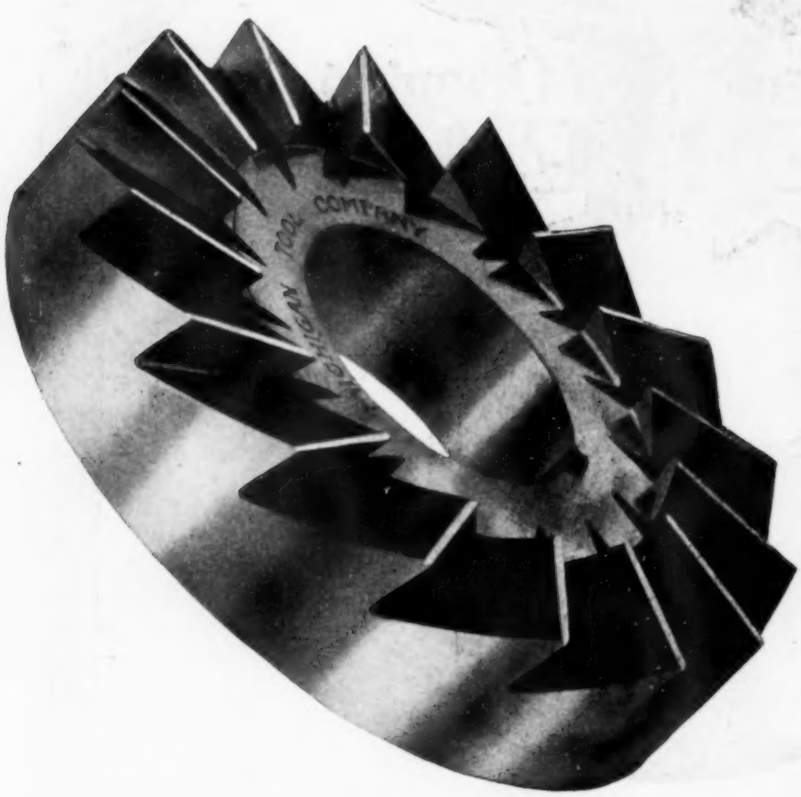
Truly it's a slick tool!

***Write for booklet.***

**Eastern Machine Screw Corporation**
**New Haven, Connecticut**

Representatives in Great Britain: Goodchild & Partners, Ltd., Eagle St., Southampton Row, London, Eng.

# Michigan Tool Co.



In shops where efficiency counts, you will generally find Michigan Tools. Machinists know that they insure smooth running, continuous production, and uniform accuracy.

Then if you will send us blueprints, we will gladly give you an estimate.

**Michigan Tool Company**
**Detroit, Mich., U. S. A.**

**Spiral**
**Spur**
**Worm Hobs**

**Special Tools**
**of all descriptions**

# Drill Twenty Holes as Quickly as One

In the familiar gas stove the hole controls the flow of the fuel, so that it may burn safely and economically.

Count the holes in the burners of your stove at home.

Do you realize that all of them were made at one time, and more quickly than you can snap your fingers?

The speed and accuracy of Detroit Twist Drills helps release the housewife from the heavy demands of the coal range.

Detroit Twist Drills are making holes cheaper every day, because they produce truer, quicker holes, with less regrinding and less cost for power.

When you buy, specify Detroit Twist Drills.

**DETROIT TWIST DRILL CO., DETROIT, U. S. A.**

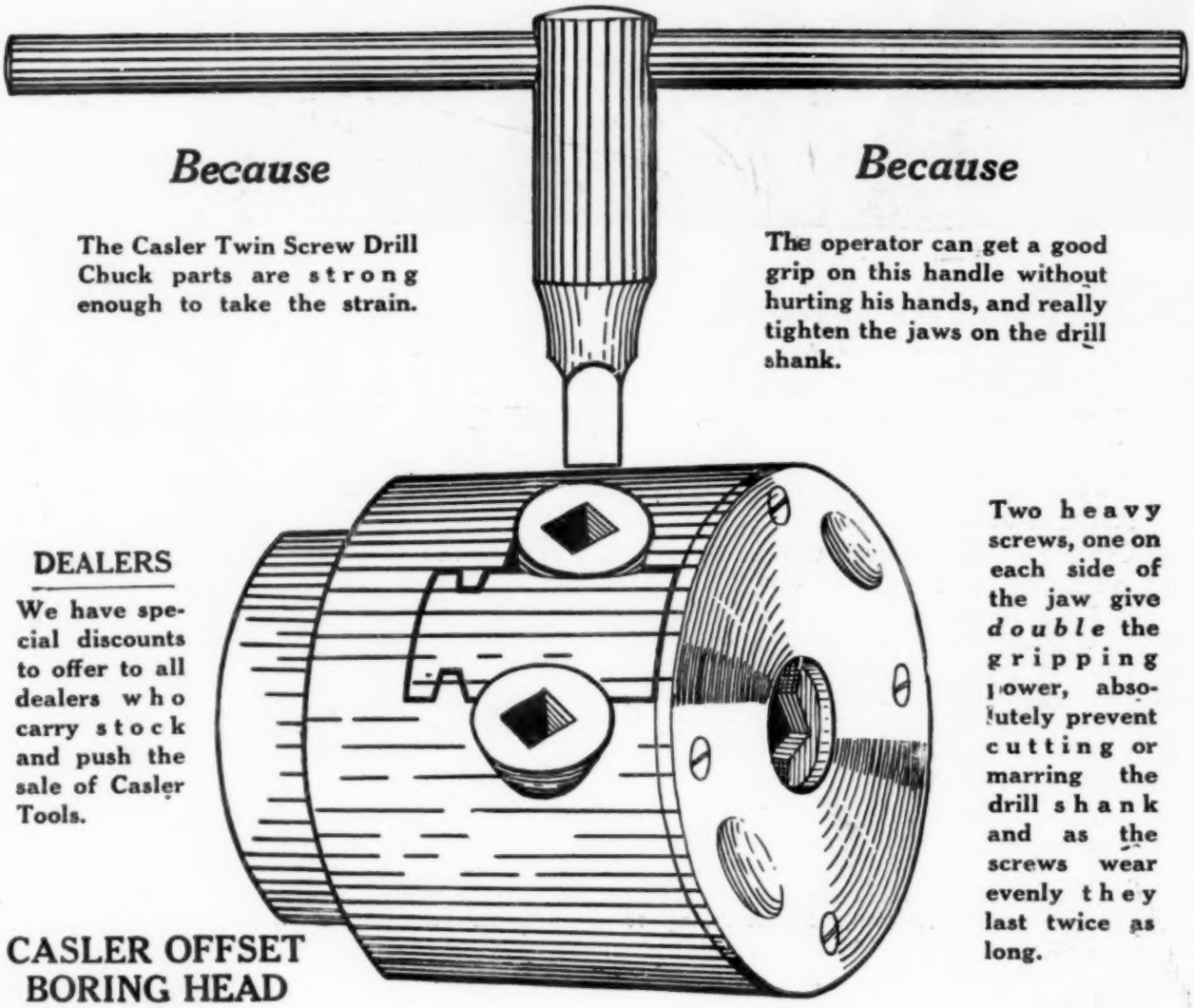
*Metallurgical Inspection and Heat Treating*

# DETROIT TWIST DRILLS

# CASLER

## WHY is this handle so long?

ACTUAL SIZE



### *Because*

The Casler Twin Screw Drill Chuck parts are strong enough to take the strain.

### *Because*

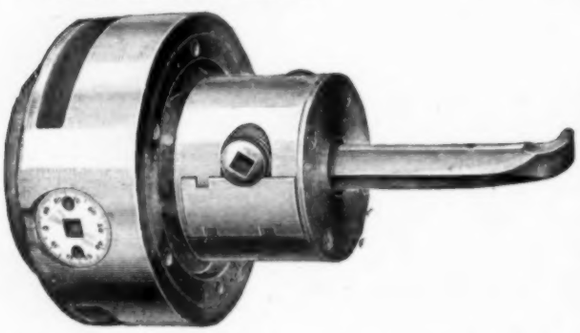
The operator can get a good grip on this handle without hurting his hands, and really tighten the jaws on the drill shank.

**DEALERS**

We have special discounts to offer to all dealers who carry stock and push the sale of Casler Tools.

Two heavy screws, one on each side of the jaw give *double* the gripping power, absolutely prevent cutting or marring the drill shank and as the screws wear evenly they last twice as long.

### CASLER OFFSET BORING HEAD

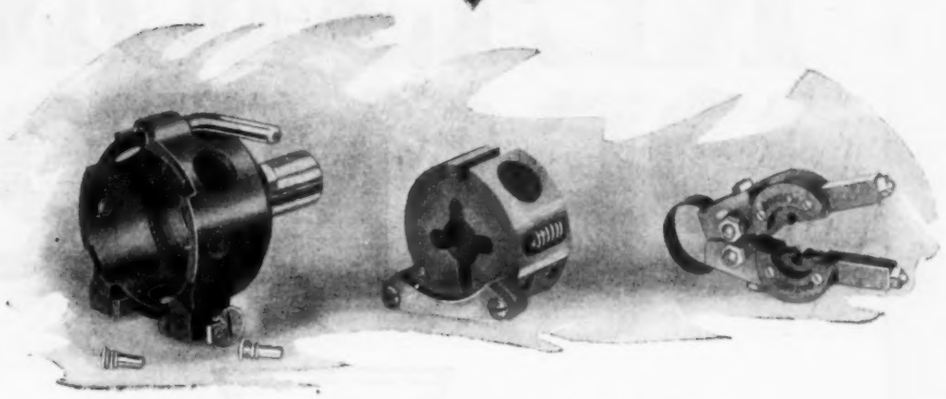


This tool was designed and built for use on the milling machine for boring accurate holes in jigs, fixtures and machine parts. The Brown & Sharpe Mfg. Co., Providence, R. I., are now prepared to furnish the Casler Offset Boring Head with their milling machines.

Order these tools from your nearest dealer and if he does not carry in stock, we will ship directly on thirty days' trial.

## Marvin & Casler Company, Canastota, N. Y., U. S. A.

FEDERAL PRODUCTS For Exacting Work



# 90 SECONDS

## for Taking Apart, Cleaning and Assembling

Because the FEDERAL SELF-OPENING DIE HOLDER has only three main parts and two screws to be handled.

Other reasons why the FEDERAL is leading the field on automatic and semi-automatic machinery for cutting threads ⅛-in. to 1¼-in.—

1. The spacing threads of the button dies used are not backed off for cutting, so that
   a. Threads are seldom stripped, and
   b. There is less tendency to lengthen or shorten the lead, after the button die is once set, when the operator forces or allows the die to drag.
2. The inexpensive standard button dies used can be quickly obtained from the stockroom of the machine shop or from a nearby hardware dealer.
3. The initial accuracy of the FEDERAL is maintained for an exceptionally long period, there being no wearing surfaces where the cutting tool is supported.
4. The FEDERAL has adjustment whereby the split button die can be brought back to the same position in which it was when solid, thus insuring a correct lead.
5. Graduated screws at the base of the head afford a quick and accurate means of adjustment for diameter to compensate for the wear of the die.
6. The button die, when split, is more easily and more quickly sharpened.
7. The FEDERAL automatic features eliminate the time consuming and destructive "backing off" process necessary in the ordinary use of the solid die.

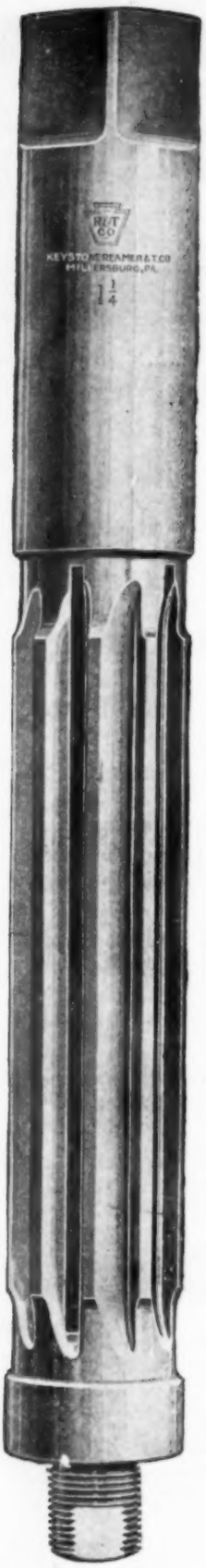
Standard Button Die before splitting

**Descriptive literature sent on request.**

Split Ready for Holder

## THE FEDERAL PRODUCTS CORPORATION

**393 Harris Avenue, Providence, R. I.**




# KEYSTONE REAMERS

R. & T. CO.

## "Keystone"=Satisfaction

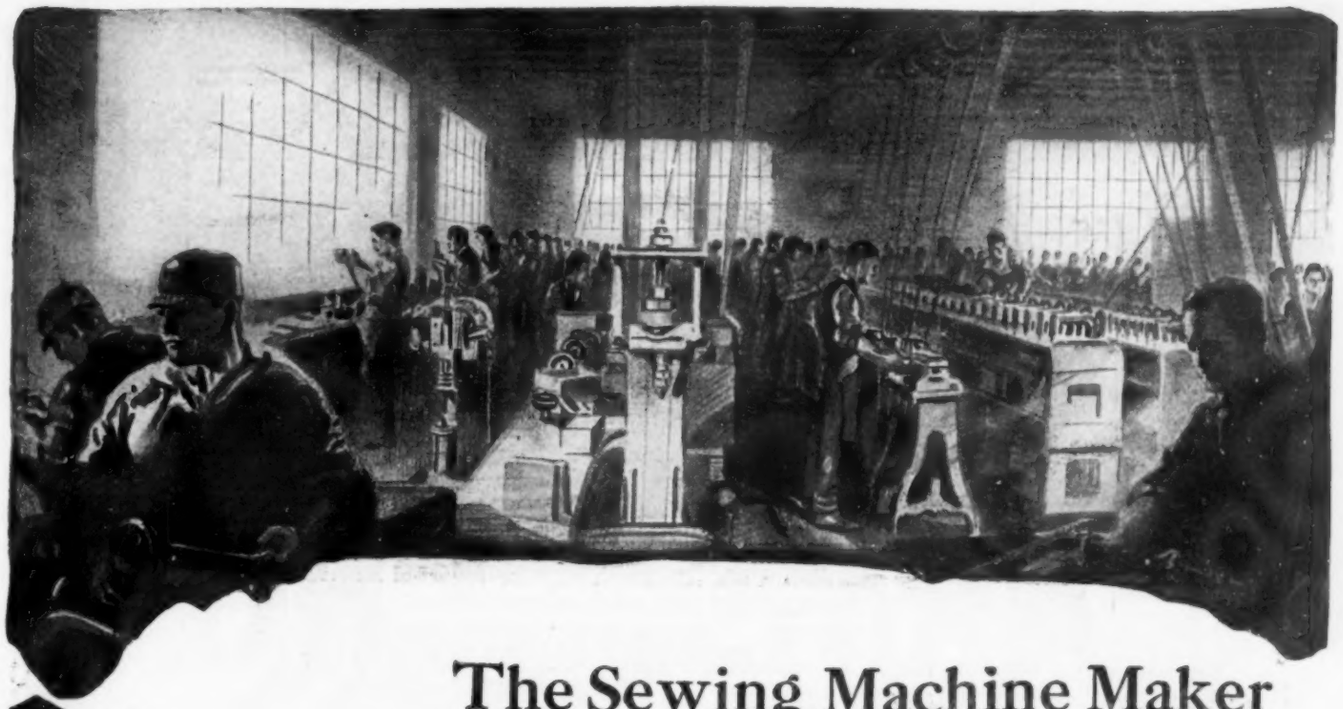
**"KEYSTONE REAMERS"**
**Once a user—Always a satisfied user**

*Have you our catalog?*

**Keystone Reamer and Tool Co.**
*Reamers, Cutters and Small Tools*
**Millersburg, Pa., U. S. A.**

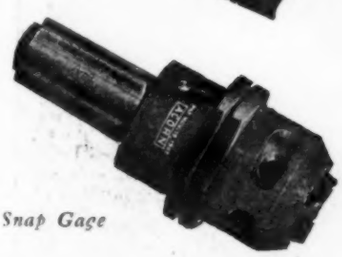
NEW YORK OFFICE:
30 Warren Street

CHICAGO OFFICE:
180 N. Market Street



# The Sewing Machine Maker Who Made His Own Tools

*Gun Tap*



*Snap Gage*

*Acorn Die*

*Our booklet "Tools and Dividends" suggests ten questions every executive, plant superintendent or purchasing agent ought to ask. Your copy is ready for mailing.*

MANY manufacturers make their own screw-cutting tools—and believe they are saving money.

One of the largest sewing machine makers was among this number. Not until the problem of rising costs confronted him did he make a real investigation.

Then he sent for a GTD engineer.

The GTD man said, "Your machines can be assembled more quickly—and more cheaply—if the threaded parts are made better and more accurately."

To prove it, the GTD laboratories cut threads with Greenfield taps and dies and photographed them. Then they cut the same size threads with tools made by the manufacturer and photographed those.

The pictures at the bottom of this page tell the story. They convinced the manufacturer that he could not only *buy* better screw-cutting tools than he could *make*, and buy them cheaper, but that he could save thousands of dollars formerly lost through assembling difficulties caused by imperfect threads.

The Greenfield Tap & Die Corporation invites every manufacturer who is making his own taps and dies to try this experiment.

Send to Greenfield a thread cut by your own tools and let it be *micro-shadographed* by our special high-powered projection cameras.

In nine cases out of ten the thread will be ragged and crude compared with the threads which GTD taps and dies produce.

This offer is a part of our service which enables manufacturers of machines, motors, implements and appliances, to make use of our 46 years of screw-cutting experience. The suggestions of our men may save you time, money and materials now being wasted.

*Fig. 1—Projection photos revealed these imperfections in a screw thread. This screw was cut by tools made by a sewing machine maker for his own use, and supposed to be perfect.*

*Fig. 2—This screw was cut by a GTD tool. Its clean threads, when highly magnified, showed entire freedom from imperfections ensuring an accurate easy fit in the parts of the machine.*

GTD

# GREENFIELD

## TAP & DIE CORPORATION

Greenfield, Massachusetts, U.S.A.

*World's Largest Manufacturers of Screw Cutting Tools*

# When Buying

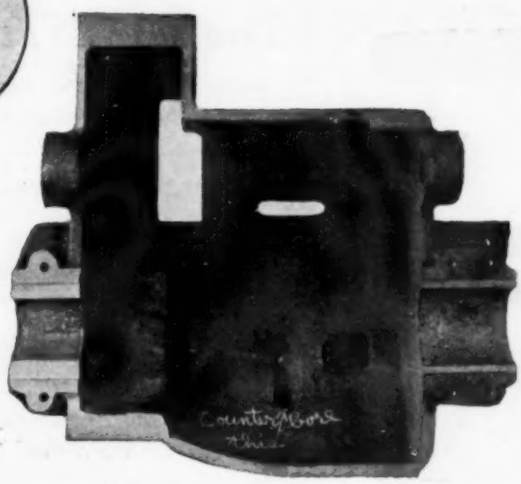
When you buy a Set Screw Tool Holder look for the name ARMSTRONG on it, which indicates originality and time proven quality. Seldom indeed does a copy equal in any degree the original.

The measurements, general proportions and appearance may be the same but the original usually remains supreme and cannot be duplicated.

*Specify Armstrong and Get the Best*

*Catalog mailed free upon request.*

**ARMSTRONG BROS. TOOL CO.**
"THE TOOL HOLDER PEOPLE"
315 N. FRANCISCO AVE. CHICAGO, U.S.A.

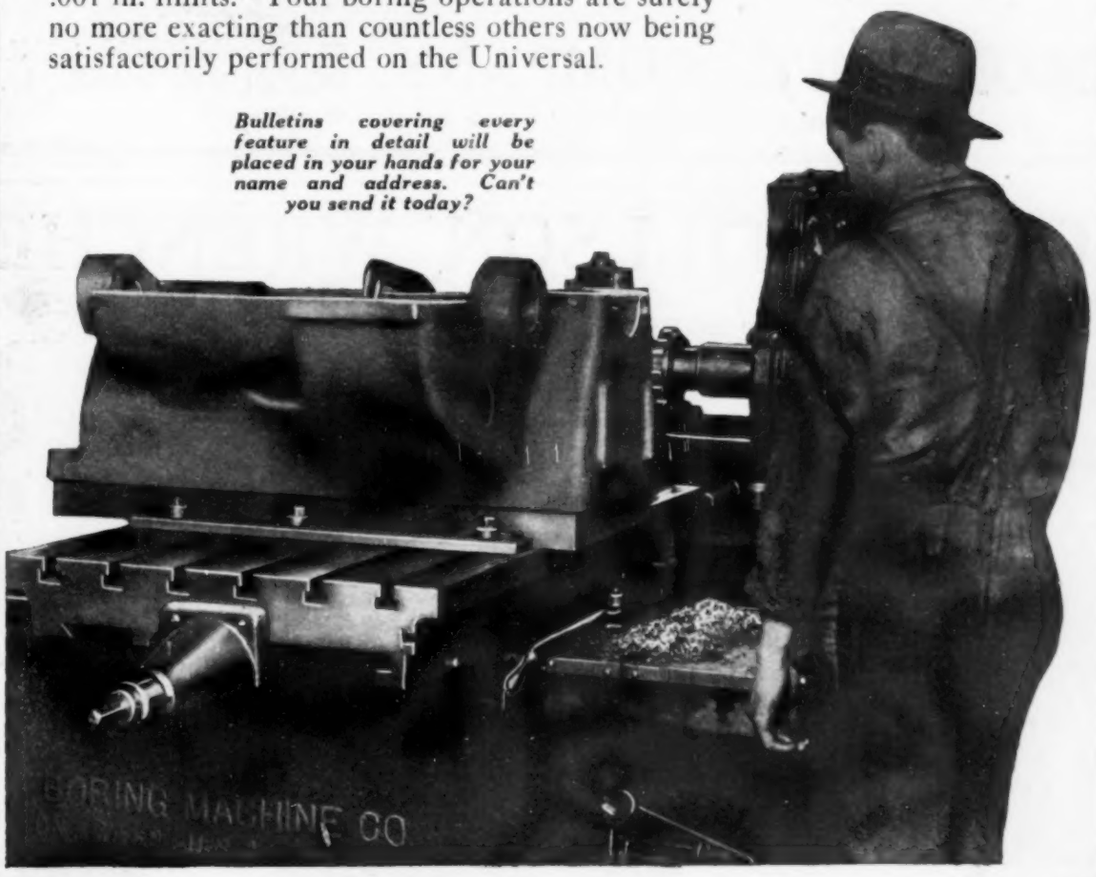


**15 pieces—**
**45 operations—**
**all in one day on the**

# UNIVERSAL
**(horizontal)**
# BORING MACHINE

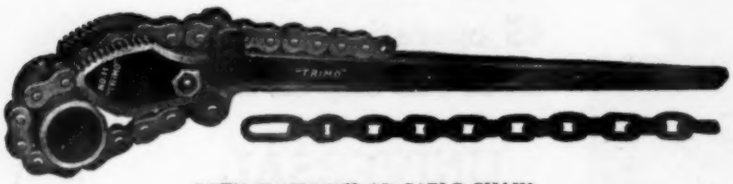
There are three operations on each of these cast iron Lathe Headstocks and the Cisco Machine and Tool Co., of Cincinnati, say their Universal is a wonder in completing them all. The end pad is milled and the spindle bearing and back gear arms are bored to the tune of 15 pieces per day. This piece is unhandy to manage yet the Universal delivers the goods within .001 in. limits. Your boring operations are surely no more exacting than countless others now being satisfactorily performed on the Universal.

***Bulletins covering every feature in detail will be placed in your hands for your name and address. Can't you send it today?***




## Universal Boring Machine Co.
**Hudson, Mass.**

The Trimo Pipe Wrench
Made with Wood Handles in 6-in., 8-in. 10-in. and 14-in. Sizes; with Steel Handles in All Sizes.



WITH FLAT-LINK OR CABLE CHAIN
Trimo Chain Wrench

Trimo Nut Wrench
6-in., 8-in., 10-in., 12-in., 15-in., 18-in. and 21-in. Sizes.

Especially Suitable for Railroads

# TRIMO

## The Word Trimo

stands for good tools made by the Trimont Mfg. Co., which are the following:

**The Trimo Pipe Wrench**
**The Trimo Chain Pipe Wrench**
**The Trimo Monkey Wrench**
**The Trimo Pipe Cutter (Hand)**
**Sold at Same Price as Others**

## The Four Good Points

that make the ***Trimo Pipe Wrenches*** superior are the ***Spiral Spring*** always in place—***Steel Frames*** that will not break—***Nut Guards*** that protect adjustment nut—and the ***Inserted Jaw in handle*** that can be replaced when worn. ***Save money*** and buy Trimo goods, made by

**TRIMONT MFG. COMPANY,** 55-71 AMORY STREET, ROXBURY, MASS., U. S A.

***Send for Catalog No. 75, describing our Complete line.***

# MOORE STILLSON WRENCHES

THE "MONEYBACK" GUARANTEED WRENCH

MOORE Stillsons are called the "Moneyback" Wrench for the reason that every part is considered a vital part and the Moore reputation rests on the quality of the assembled wrench.

The jaws and bars drop forged from specially selected steel, all parts are carefully made to gauge. This assures absolute interchangeability. The faultless finish of the wrench makes it a source of pride to its owner, and the rigid inspection guarantees long life in service. If it fails to satisfy your money awaits your call.

Our literature is comprehensive in its range. It has a place in your files. Send in your name and address at once.

**Moore Drop Forging Co.**
*Also large makers of Drop Forgings*
Springfield, Mass.

TRADE M MARK

**Sales Representatives:**
Surplee, Dunn & Co., 76 Murray St., New York City and 34 North Clinton St., Chicago, Ill.

# Lovejoy Inserted-Cutter Tools

## The nearest thing to solid forged tools

They have the merits of solid forged tools without unnecessary overhang and objectionable projections. Their cutters are positively locked, the tool thrust being taken on the locking key which in turn takes its seat on the solid metal of the holder. This design gives Lovejoy Tools exceptional strength to resist the strains of present-day feeds and speeds.

***Our catalog contains some mighty good dope on Cutting Tools. Send for your copy.***

LOVEJOY TOOL COMPANY, INC.
SPRINGFIELD, VERMONT, U.S.A.

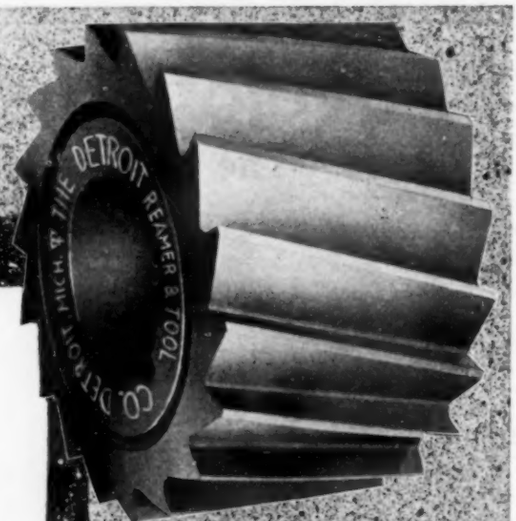
# The Equal of 75 Forged Tools

The illustrations show just two of the seventy-five positions possible with the PARKER UNIVERSAL TOOL HOLDER and its fifteen cutters. It meets every need of lathe, planer or shaper. A few Parkers will take the place of an extensive stock of forged tools.

***This is a saving worth investigating. Write today for bulletin giving details of construction and accomplishment.***

Parker Machine Company
221 High St.
Boston, Mass., U. S. A.

# DETROIT Milling Cutters




Our cutters honestly back the Detroit reputation. They have the same materials, same workmanship, same finish as other Detroit Tools.

No matter the style of mill, tool or cutter your work demands—a Detroit can be had that will do the job better.

Detroit cutters are regularly made of high-speed steel but may be had in carbon steel when desired. If you once use Detroit Reamers you will always call for them.

Get our list—look over our line—and we'll add another name on our order books.

**The Detroit Reamer & Tool Co.**
**Detroit** **Cleveland**

*High Speed and Carbon Steel*

*Special Form Cutters on Order*

# AMERICAN SWISS FILES

## Individuality

Each tooth on an American Swiss file is made as if it were individually cut, sharpened and tempered by an expert toolmaker. The steel is chosen especially for its file-making quality. The annealing and tempering is necessarily uniform because of our special heat treatment. Each tooth has mechanically the right cutting angle, shape, slope and clearance because of our special cutting machine.

**These are the features that give the American Swiss files their individuality. *Write now for styles and prices of the file that is***

**UNIFORM from TIP to TANG**

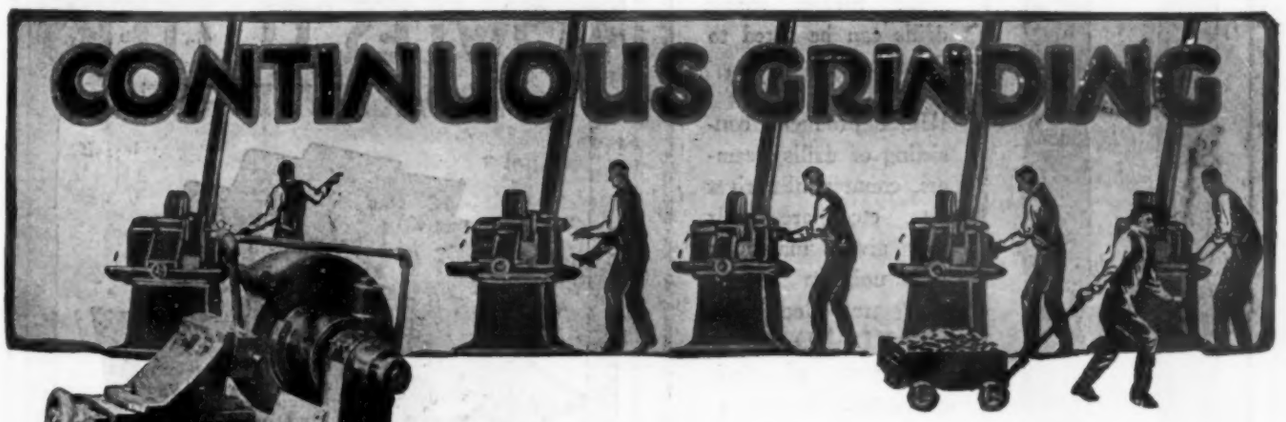
**American Swiss File & Tool Co.**

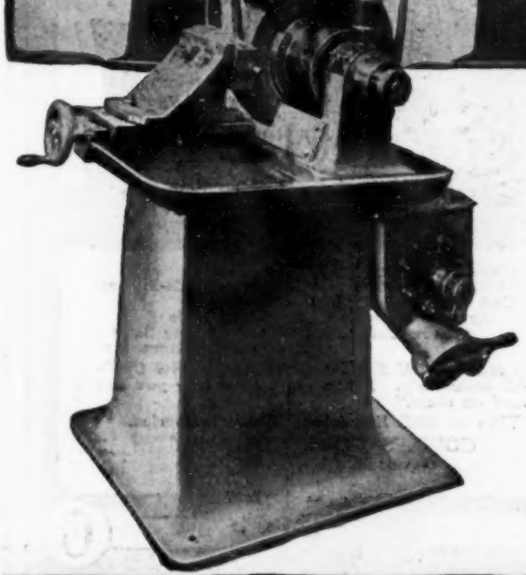
**E. P. Reichhelm & Co., *Selling Agents***
**24-26 John Street, New York**

# The Gale-Sawyer Company
## Boston, Mass.

**Rose Chucking Reamers**
**Woodruff Keyseat Cutters**
**Taper Pin Reamers**
**T Slot Cutters**
**Side Mills**
**End Mills**

Gale-Sawyer Small Tools are as wide in variety as they are high in repute. We carry in stock a size and style to meet every small tool need — if not, we can make to order on short notice. Carbon and High Speed Steel. Send for our stock list and note the completeness of our line.



So many are writing, asking for production on piston pins or wrist pins.

Here's our formula: Use it yourself.

| Diameter. | Ft. of Pins per Hr. | Diameter. | Length. | Pcs. per Hr. |
|---|---|---|---|---|
| 1.250—1.249 | 20-ft. | 1¼ | 4 | 60 |
| 1.000— .999 | 22-ft. | 1 | 3¾ | 70 |
| .750— .749 | 24-ft. | ¾ | 3½ | 82 |
| .500— .499 | 28-ft. | ½ | 2 | 168 |

*For the sake of acquainting the public with the quality of work possible we grind FREE OF CHARGE 25 OR 50 SAMPLES FOR ANYONE. Write us today.*

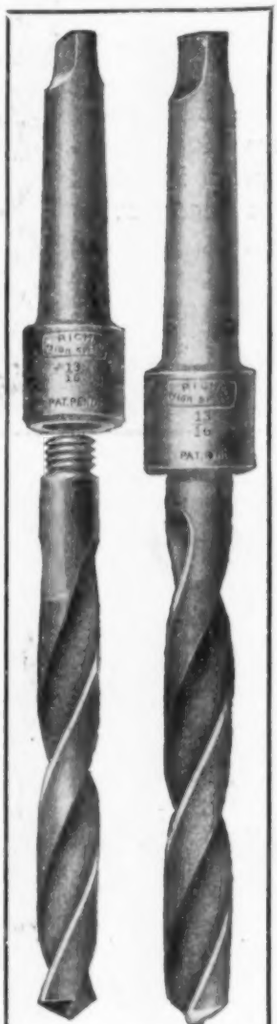
**DETROIT TOOL CO.**
**DETROIT**

# Drill Salvage

## AS FIRST AID TO RISING SHOP COSTS

A message to the man responsible for costs and production.

The mortality of shop tools is a subject to which you have given much thought. Drills and reamers will wear and break and accidents will happen. Perfectly good drills will break off at the shank or a perfectly good shank must be discarded when the drill is damaged or worn out.



List No. 22
Two-Piece
Interchangeable

The RICH No. 22 2-Piece Interchangeable Drill makes it possible to conveniently and economically reclaim your broken shank-drills and thus place your shop costs on a lower level. The blades or shanks may be obtained separately. Your broken shank drills can be fitted to these sockets.

RICH products, consisting of drills, reamers, countersinks, rivet sets, etc., are built to give maximum and uniform results, and are adopted as STANDARDS in shop equipment of their character.

***Write for literature and prices.***

## RICH TOOL CO.

**Railway Exchange**
**CHICAGO**

BRANCHES IN ALL PRINCIPAL CITIES

2A

# BUCKEYE

***The Central Thought***

In connection with Buckeye Drills, Reamers and Special Tools is the excruciatingly careful inspection we give them before shipment. Each tool is of the finest steel. Each inspector is a specialist in judging the finished product.

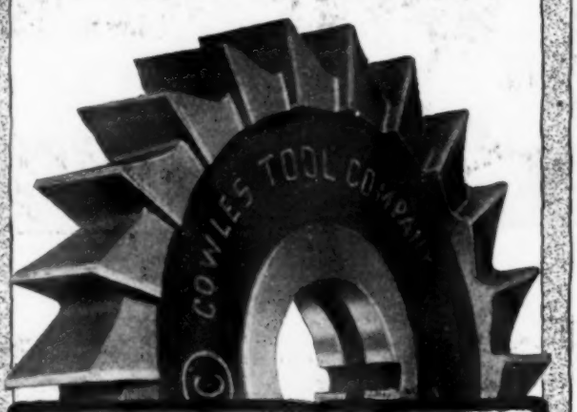
***May we send you our Catalogue?***

**The Buckeye Twist Drill Company**
**Alliance, Ohio**
Chicago Office:
26 South Jefferson St.
New York Office:
2 Rector St.

# TWIST DRILLS

# COWLES CUTTERS

## QUALITY FIRST




Plain Milling Cutters
Side Milling Cutters
End Mills
Angular Cutters
Convex Cutters
Concave Cutters
Interlocking Side-Milling Cutters
Shell End Mills
Metal Slitting Saws
Special Cutters, etc.

***"We make HIGH SPEED STEEL MILLING CUTTERS exclusively. That's one reason why you can depend on them."***

Wire or Mail Enquiries. Quick Deliveries.

**COWLES TOOL COMPANY**
Cleveland. Ohio, U. S. A.

# NATIONAL-CLEVELAND

## Let's Get Better Acquainted

The quickest and most satisfactory method of becoming acquainted with Quality National-Cleveland Tools is a trial order.

We feel sure it will lead to permanent business relations. Send it today.

**The National Tool Company**

**Cleveland, Ohio**

Chicago Salesrooms: 26 S. Jefferson St. Philadelphia Salesrooms: 40 North 7th St. New York Office: Room 553, 90 Church St., N. Y. The National Tool Co., 139 Queen Victoria St., London, E. C. 4.

Right Hand Offset

Left Hand Offset

Straight

PRICE LIST
Order By Number

| No. | Size Holder | Cutter | Weight | Price | Extra Vise and Nut |
|---|---|---|---|---|---|
| 1 | 5-16x5-8x3½ in. | 3-16 in.sq. | 1-3 lb. | $3.00 | $1.25 |
| 2 | 3-8x7-8x5 in. | 1-4 in. sq. | 3-4 lb. | 3.50 | 1.50 |
| 3 | 1-2x1¼x6 in. | 5-16 in. sq. | 1½ lb. | 4.00 | 1.75 |
| 4 | 5-8x1¼x7 in. | 3-8 in. sq. | 2 lb. | 5.50 | 2.00 |
| 5 | 3-4x1¼x8 in. | 7-16 in. sq. | 3½ lb. | 5.50 | 2.50 |
| 6 | 7-8x1¼x9 in. | 1-2 in. sq. | 4½ lb. | 7.50 | 3.50 |

All goods sold F. O. B. N. Y. City

# A Decided Economy

is to be had by the use of Economy Tool Holders. It is the combination three-in-one holder, it taking only a few seconds to change the bit from straight to right or left hand offset. There are no parts to be worn away by chips, no bolt point to break or loosen hold on bit.

## Economy Tool Holders

will also enable you to use your bits to the fraction of an inch. Many of the bits you are now throwing into scrap could be used for quite a time with the Economy, if pointed up. The grip is certain and is the entire length of the vise.

We will send Economy Tool Holders to you on approval, so sure are we of their worth. We know that once you have used them you will never want to change again.

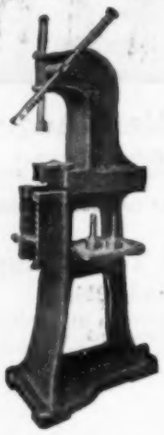
*Let us know the sizes you are interested in.*

**Economy Tool Holder Co.**

**103 Park Ave., New York**

*Telephone 299 Vanderbilt*

**Nicholson Products are Guaranteed Products**



Nicholson Arbor Press No. 3 with stand and drivers.

Note adjustable shelf for any length arbor or press.

Capable of exerting a pressure of 6,750 lbs.

## The Arbor Press That Does the Work Quicker and Better

The elimination of lost motion is the secret of factory production. Doing the work quicker and better means greater output and decreased overhead costs.

### Nicholson Arbor Press
**"Knocks it out in a Jiffy"**

Not only does the "Nicholson" save workmen's time, but it saves many bushings, shafts, pinions, arbors, etc., that would otherwise be destroyed by use of a sledge.

The "Nicholson" is constructed of highest grade materials. It is designed to withstand years of service and is the last word in arbor presses of real service.

A Nicholson Arbor Press will be installed in your plant for 30 days' trial. Unless it proves an investment to you, return it at our expense.

**W. H. NICHOLSON & CO.**
**114 Oregon St., Wilkes-Barre, Pa.**

# CASTELLATING
## Machine

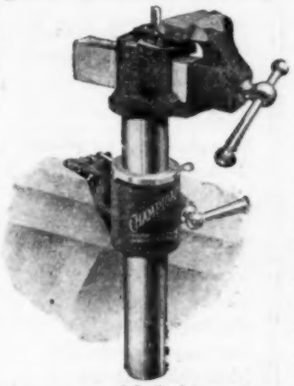
You are having trouble slotting nuts. Our machine will put a song in your heart. ¼-in. to ½-in. nuts. 400 to 700 complete per hour.

***Ask your dealer or write us for full information.***

**THE CRAFTSMAN TOOL COMPANY**
**CONNEAUT, OHIO.**

CELFOR
Forged Drills
turn the power built into heavy duty machines into results.
*Let us show you why*
CLARK EQUIPMENT CO.
Office and Works: Buchanan, Mich.
Canada—Rudel-Belnap Machinery Co., Montreal and Toronto. Great Britain—The Coats Machine Tool Co., 14 Palmer St., Westminster, London, S. W. Japan—Andrews & George, Tokyo. Dale-Brewster Machinery Co., Chicago.
For Heavy Duty Drilling & Reaming

American Twist Drills
Are Supplying the Demands for Greater Production
Wherever competitive tests have been held American Forged H.S. Twist Drills have surpassed all other makes. Incorporated into them is the material and workmanship that will meet the highest standards of your production.
American Twist Drill Co.
Detroit Mich.



## It's a Champion

This vise is designed along true mechanical lines with efficient devices for all functions. There is no excess of weight. All parts are of greater strength than those of the old-style vises, and are so gracefully proportioned that when assembled into the completed vise the appearance is that of a finished tool.

## SHOP FURNITURE

No more loss of tools. Complete line of stationary and portable stands, trucks, etc., meeting all modern shop requirements.

*Write for our Catalog.*

**The Western Tool & Mfg. Co.**
**Springfield, Ohio, U. S. A.**

---

## Carbon and High Speed DRILLS

**Prices Right** — **Reliance Supreme Quality**

**Try us on your Drill Orders**

High Speed and Carbon
Reliance Supreme Quality
Price Consistent

**The best stock in America**

High Speed & Carbon Drills
Reliance Supreme Quality
Prices Interesting

*We can give you every size from 1/64 to 3 inches Immediately—No Waiting*

**Reliance Steel & Tool Company**
**24-26 Murray Street**
**New York**

---

## Down Goes the Cost of Production!

A File which makes it possible to produce ten pieces where only nine were produced before, distributes labor and overhead costs over the larger number of pieces. Thus it reduces these important items to the extent of 10% per piece produced.

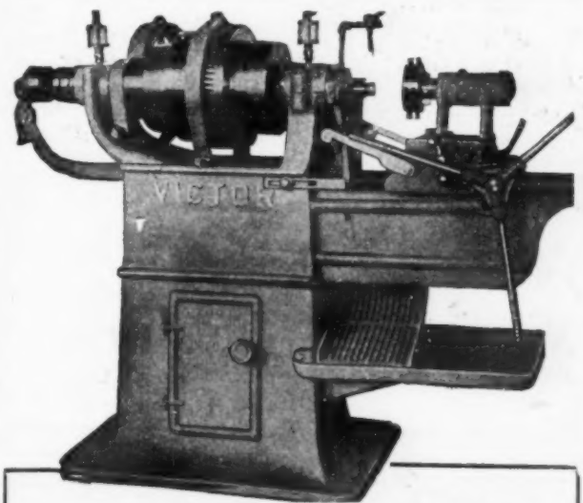
Vixen files cut three to five times faster than ordinary types. Think what this means, and you will understand why they are the most economical although the highest priced.

*Write for full particulars.*

**VIXEN TOOL CO.**
**Newark, N. J.**

**VIXEN FILES**

---




## Speed and Accuracy in Nut Facing

Fast work with the "Victor" makes it a very profitable nut facing machine for manufacturers. The average operator on the "Victor" faces from 600 to 720 ¼-inch to ⅝-inch nuts per hour, and larger sizes in proportion. It is a very simple machine in design, durably built and faces nuts rapidly and true to thread. Special construction avoids inaccuracies in work.

The "Victor" No. 1 is designed for facing nuts from ¼ in. to 1½ in., the No. 2 from ¼ in. to 2½ in., while the No. 3 has still greater capacity.

**Our Circulars Will Interest You**

*Manufacturers*
**VICTOR TOOL CO.**
**Waynesboro, Pa.**

**Departments**
Machinery
Small Tools
Valve and Steam Goods
Transmission
Cranes and Electrical
Construction and Railway
Metals
Textile Machinery
Tractors
Motors and Trucks
Agricultural Machinery

TELEPHONES:
BARCLAY
8645—8646
8647—8648

**Young, Corley & Dolan, Inc.**
Engineers, Contractors and Manufacturers' Representatives
28-30 West Broadway, New York

**Branch Houses and Representatives**
Boston, Mass.
Paris, France
Manchester, England
Brussels, Belgium
Christiania, Norway
Barcelona, Spain
Tokyo, Japan
Yokohama, "
Kobe, "
Osaka, "
Dairen, Manchuria
Shanghai, China

ADVANCE

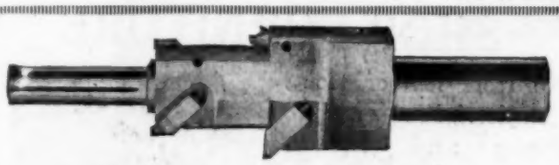
**Pick your small tools on a production basis**

Your small tools are just as important as your expensive equipment. The output of a big milling machine depends largely upon the ability of the cutter to stand the heavy strains.

Advance Small Tools are only small in size—they produce big results. Highest grade materials and workmanship. Our Catalog shows our complete line of Counterbores, Woodruff Cutters, End Mills, Side Mills, Gauges, Mandrels, Machine and Hand Planers.

**Write today for your copy.**

**The Advance Tool Co.**
Canal and Jackson Sts., Cincinnati, Ohio



**3 Operations in One Pass Economize with**
**KELLY MULTIPLE PRODUCTION TOOLS**
*Send for Our "Brown" Catalog*
**THE KELLY REAMER COMPANY**
Cleveland, Ohio, U. S. A.

**J. B. G. FILES**
*Are Good Files*

They've always given me the best of service. They wear long and bite hard.

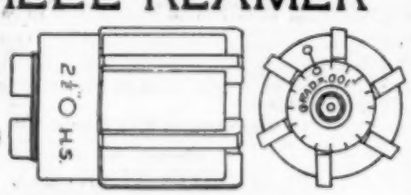
If you try them you'll be satisfied, too. They're made for all purposes—both files and rasps—American and Swiss patterns.

**Just send and ask for full information. Grover File Handles are Handles everlasting. Investigate!**

**THE GROVER FILE CO.**
Nashua, N. H.

CASHMAN
ADJUSTABLE
SHELL REAMER

WRITE TODAY FOR CATALOG "A"



**CASHMAN TOOL CO.**
Waynesboro, Pa., U. S. A.

***Think of it!***

What would you say if you could immediately convert your drilling machines into high-grade tapping machines? It would be "some stunt." Yet this is exactly what Dorman Tapping Attachments will do. No. 1 taps from ¼ in. to ⅝ in., No. 2 up to ¾ in. and No. 3 up to 1 in. All built to wear and work.

**Why not write for information today?**

**JOHN H. DORMAN & SON**
1-9 Bethune Street, New York City

Agents for Great Britain, Belgium, Switzerland, China, Japan, India, Paris, France, and Milan, Italy, Alfred Herbert, Ltd., Coventry, England. Los Angeles, Portland, Ore., and San Francisco, Eccles & Smith Co.

## SPECIAL FEATURES OF THE BEEMAN'S "TIME-SAVER" LATHE CENTER

**The SELF OILING** feature provides for a **constant flow** of oil at point of center.
It does away with the use of white lead in the center hole.
It **eliminates** the oiling of the center hole of the material before placing work on lathe and again **stopping** the machine to back out center for re-oiling.
**The INTERCHANGEABLE POINT** is a **time** and **money saver.** It is easily and quickly replaced when worn out or in need of re-grinding.

The points are made of **Special Alloy Tool Steel** and the shanks of **High Carbon Tough Steel.**
Carried in stock in Morse Tapers from Nos. 2 to 7, special sizes to order. Points are ground to 60 to 70 degrees.
Users are finding it a big **profit producer.**
Just say you're interested and we'll gladly tell you more about them.

The Center with a Constant Flow of Oil.

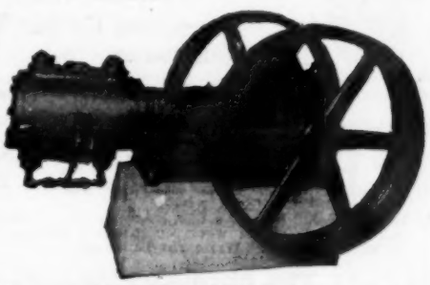
The Center with Interchangeable Points.

**EVERY ONE IS GUARANTEED TO BE RIGHT**

**MANUFACTURERS' HARDWARE CORPORATION, Milwaukee, U. S. A.**

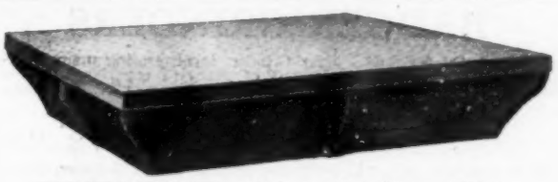
## The end of your Air Compressor troubles

is at hand when you install the Stratton & Bragg Air Compressor. It is well designed, simple, durable and reliable in operation. It is easy to adjust and free from the ordinary compressor troubles. The best of materials and workmanship enter into the construction of these single stage, straight line, center crank, belt-driven machines.



*Write today for details.*

**Stratton & Bragg Co., Inc., Petersburg, Va.**



## SIMPLEX Precision Surface Plate

Just the right size for use on a bench in laying out or inspecting machine parts and special tools.
It is well ribbed so as to preserve its original shape and accuracy.
The top is specially heavy and can be repeatedly scraped. Guaranteed to be perfectly flat.

| Sizes | Price Planed | Price Scraped |
|---|---|---|
| 13 x 15 | $16.00 | $30.00 |
| 20 x 30 | 50.00 | 90.00 |

Mail us your order

**The Simplex Tool Company, Woonsocket, R.I.**

## The Handiest Tool on the Bench

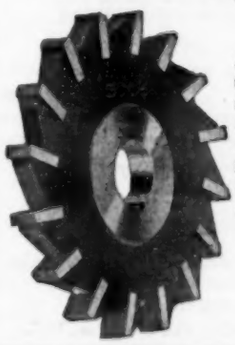
This Critchley Improved Expanding Reamer will solve your hole finishing problems. It has a range from 15-32 to 1 17-32-inches and expands from 1-16-inch in the smaller sizes to 3-16-inch in the largest. Eleven sizes to meet every need.

**Critchley Improved Expanding Reamers**

have six blades of high-grade tool steel slightly staggered to prevent chatter. Ample allowance for grinding assures long life to the blades. Send for our circular and note their features.

Made by
**Cutter & Wood Supply Co.**
Boston, Mass.

## Economy in Cutters



**Reduction in Cost**

A radical change in method of constructing cutters that produces results worth while to investigate. *High-Speed blades* permanently united to *tough alloy bodies* by a new brazing process making a solid cutter of the highest efficiency at a big

*Write for price list*

**H. H. Arnold Co.**
**Rockland, Mass.**

## WHY NOT?

**install this die for accurate threads at a fast rate of production.**

**CHASERS can be furnished in time for your requirements.**

**THE IDEAL TOOL & MFG. CO.**
**BEAVER FALLS, PA.**

TRADE MARK
DELTA

# DELTA FILES

HIGHEST GRADE FILE MADE. THE FILE YOU WILL EVENTUALLY USE

DELTA FILE WORKS, Philadelphia

Chicago Offices 62 E. Lake St. New York Representatives. Dilworth Lockwood & Co., 260 West St.

FILES OF QUALITY

WTT CO

## WHEEL TRUEING TOOL CO.

DIAMOND IMPORTERS
Manufacturers of
DIAMOND POINTED TOOLS
Main Office:
2130 PENOBSCOT BLDG., DETROIT.
BRANCHES:
Windsor, Ont. Milwaukee, Wis. St. Catharins, Ont.

WTT CO

## LAMINATED SHIMS

Made of LAMINUM. All features of solid shims, plus advantages of loose-leaf shims. They allow quick, accurate adjustments and give a clean smooth surface always. Send for sample.

LAMINATED SHIM COMPANY
533 Canal Street, New York
Dime Bank Bldg., Detroit.
England, R. A. Rothernel, 6 Great Marlboro St., London, W.

## GORHAM REAMERS

If you give your men the kind of tools *you* would use, then Gorham Reamers should surely find a place in your equipment—if they are not already there. Complete line of chucking and shell reamers in standard and special sizes. Gorham guaranteed, of course!

GORHAM TOOL COMPANY
Globe Bldg., Detroit, Mich.

## Milling Cutters and Reamers
## Special Formed Cutters

Hanscom Cutter Works
Hyde Park Station Boston, Mass.

## REYNOLDS Screw Driving Machine

Drives 16,000 screws a day. Automatic. Magazine fed. A boy can run it. Drives wood or machine screws. Widely used in important plants. **Write for Bulletin.**

THE REYNOLDS MACHINE CO.
Dept. A, Massillon, Ohio

## SKELTON TaperReamer

Write for Catalog

Interchangeable High Speed Blades

SKELTON TOOL CO., Syracuse, N. Y.

## BADGER GRINDERS

The recently designed Badger Grinder, incorporating many practical ideas which are the result of years of experience, places the disc grinder on the list of necessary machine tools.

**Disc Grinder information gladly furnished.**

Badger Tool Co., Beloit, Wis., U. S. A.
E. B. Gardner, Pres. "Disc Grinder Service"; R. D. Gardner, Treas.

THE "ALIVE" BALL BEARING CENTER
Saves Time in All Center Work

No more lost time in regrinding centers. No more lubricating the centers with oil, grease or whitelead. No more toothpicks or match sticks to place lubricant on center.

Full particulars and prices on request.

KELL, HOCK & Co., 354 Mulberry St., Newark, N. J.

## KELLY SHAPERS

Have the advantage of being the sole machine tool product of an organization of specialists. They possess correct design, unusual accuracy and are easy to operate. Three sizes single geared, four sizes back geared. Write for a Catalog.

THE R. A. KELLY COMPANY, Makers of shapers only for 25 years
P. O. BOX 488 XENIA, OHIO, U. S. A.

UNUSUAL FEATURES
There are features in the
## Pedrick Column Boring Machine

found in no other tool of this class now on the market. Our Bulletin treats them in a convincing manner. You should have one in your files. It's ready.

PEDRICK TOOL AND MACHINE COMPANY
3637 N. Lawrence St., Philadelphia, Pa.

## "Westhaven" "OK" Brand

DRIVE PIN PUNCHES

Made in a large assortment of sizes. Ask to see them at your tool dealers.

The Westhaven Mfg. Co. New Haven, Conn.

## TAPS

1/16 to 5 inches

Prompt quotations made on your specification — prompt deliveries on your order. Latest equipment throughout plant.

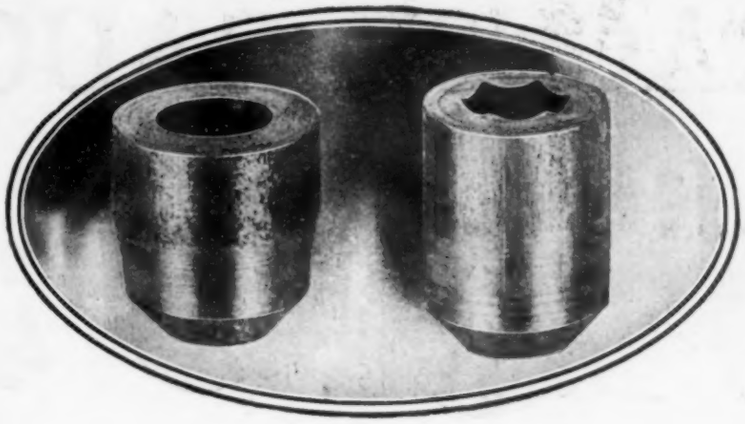
THE GARDNER-BRYAN CO., CLEVELAND

## "RED DEVIL" IMPROVED HANDLE Screw Driver

Forged tool-steel handle and blade, with wooden scales riveted on sides. Heavy enough for hammer use.

*At all dealers or write us.*

Smith & Hemenway Co., Inc., 102 Coit St., Irvington, N. J.

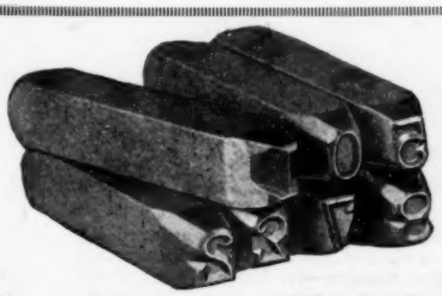


# The Makings of an ALLEN Set Screw

At left, the unsocketed "blank." At right, the same blank "hex" socketed. All the extra thickness of stock around the drilled hole shown first *drawn cold* into the second blank—the latter ready for threading. A solid hex punch, inserted in the drilled hole, drives the blank through a die; forms the hexagon socket, and strengthens the wall of the screw fully 30%. That strength makes Allens cheapest to use. That extra 30% saves you labor costs.

***Yau'll be interested in the Allen booklet***

**The Allen Mfg. Co.** 129 Sheldon Street HARTFORD, CONN.



## Anything in STAMPS

We have a stamp to meet your peculiar needs. Our complete line is the work of experts.

Write for our Catalog.

**Pannier Bros. Stamp Co., Pittsburgh, Pa.**

# HALL

## Adjustable Universal Counterbore End Mill

**Hollow Mill and Boring Tool**

This tool is the greatest money saver you ever saw. You would have to buy hundreds of dollars worth of solid tools in order to do what can be done with this one. Try one in your shop—see what satisfactory work it does, and how much it will save you in tool cost.

*Write today.*

**Hall Manufacturing Co.**
**Abington, Mass.**

Patent Pending

*Foreign Agents, Burton, Griffiths & Co. London, England*

## This Is a "DAYTON"

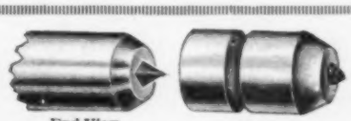
### Swaging Machine

Swaging is the way to reduce or point rods and tubes. Many of the "special' methods of production of well-known products consist of some form of swaging. Get details of the Dayton Swaging Machine and have definite facts about your own proposition.

*Write today*

**The Torrington Co.**
Excelsior Plant
Successor to Excelsior Needle Co.
Torrington, Conn.

## Keep Your



End View

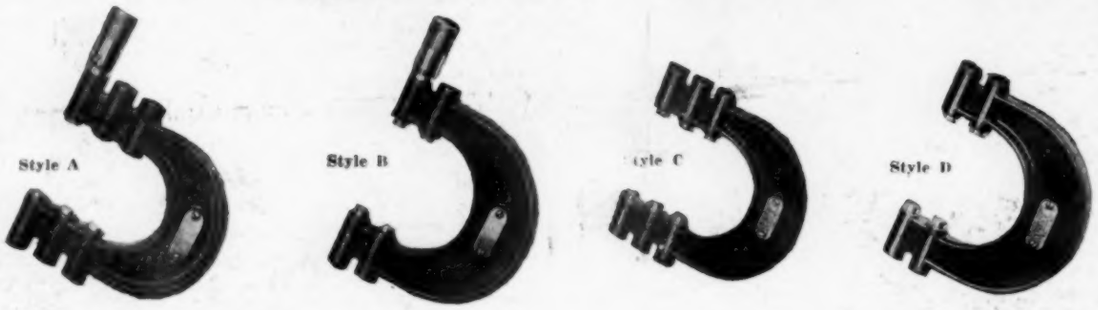
## Grinding Wheels True

With FRANCIS Diamond Grinder Tools. They are widely used, and always give satisfaction. Nothing but the hardest and best quality diamonds used. Tools for Norton and Landis Grinders, also Hand Tools and Tools of all descriptions. Ask for circular and prices. Allow us to send you an assortment for selection at our expense both ways.

End View

**Francis & Co.**
*Established in 1799.*
50 State St.
Hartford, Conn.

# SYRACUSE GAUGES




THE FRAMES of these gauges are made of gray cast iron, reheated after moulding to relieve all strains and thoroughly season the iron, thereby eliminating all possibility of destroying accuracy of setting. They are reinforced by a double rib, also providing a secure grip. The finish is black enamel, baked on.

MEASURING PLUGS are tool steel, hardened and ground accurately to a tight friction fit in the frame. Gauging faces are lapped square with the axis insuring a perfect face, bearing in all positions, corners beveled to assist in guiding gauge squarely over the work. They contain our patent method of locking.

Tampering with setting or removing plugs from the frame without breaking the seal is impossible. Our patented locking device is completely housed within the measuring plug hole, the seal covering all parts.

Repairing the faces of measuring plugs when worn is accomplished by regrinding and lapping, the adjustment in each size being sufficient to allow for this.

**All sizes up to 18 inches**

***Ask about our adjustable limit length gauge. Full particulars telling of the uses to which these gauges are adaptable will gladly be sent upon request.***

## LOWRY-KNISE TOOL COMPANY

**241 W. Adams St., Syracuse, N. Y.**

# WEST & DODGE

Get acquainted with West and Dodge gauges. They are made in every style and size! Learn why they are accepted by three governments—the United States, Great Britain and Russia.

It can be done by looking over our catalog but a quicker and perhaps more satisfactory way is a trial order.

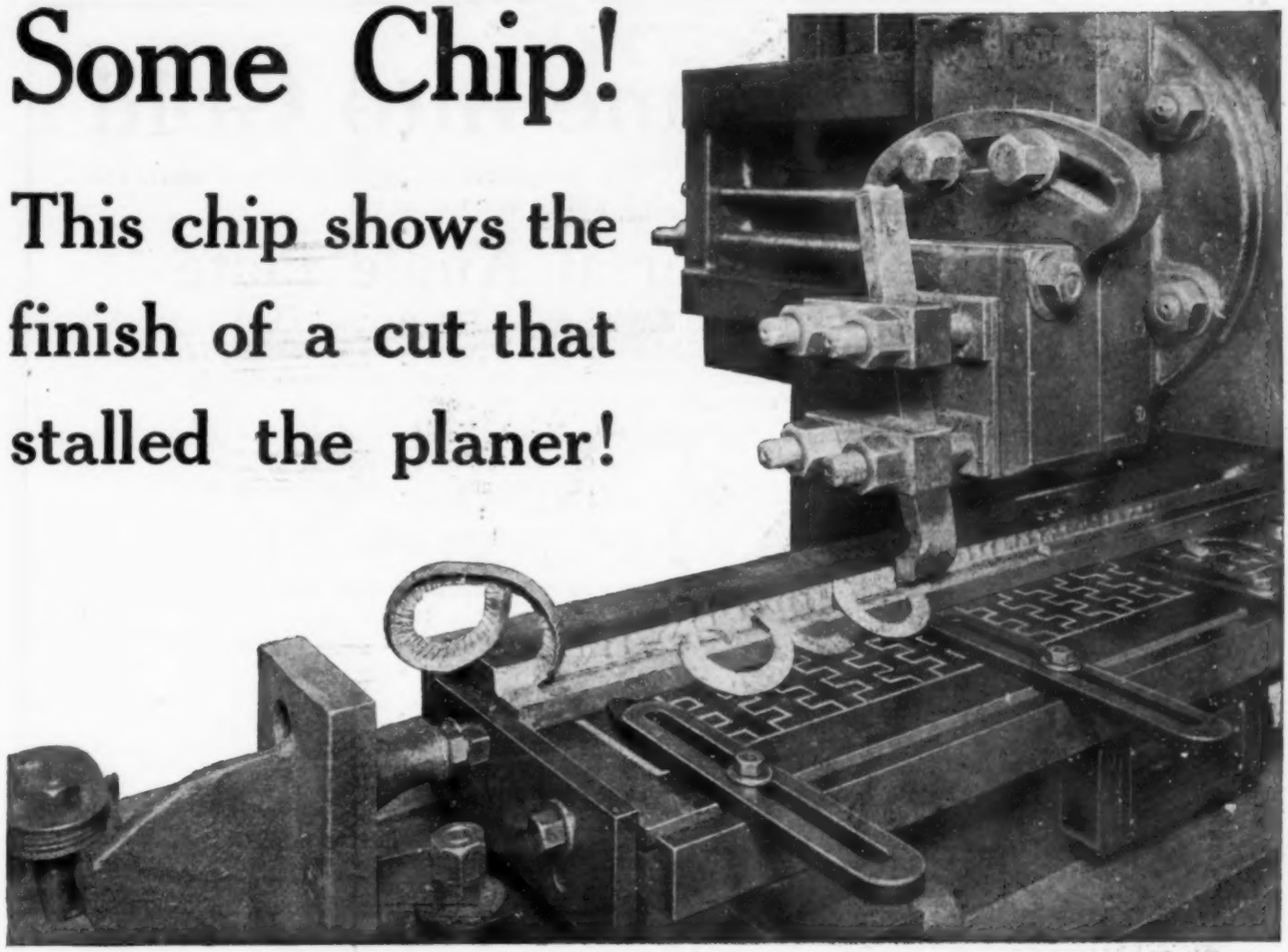
***Send it today before you forget.***

**WEST & DODGE CO.**
**Faneuil Station on Boston & Albany R.R., Boston, Mass.**

# THREAD GAUGES

# Some Chip!

## This chip shows the finish of a cut that stalled the planer!



The cut was started at the far end of the piece and the work never budged. Some of the factors that contribute to the holding power and reliability of the SIMMONS UNIT-POLE MAGNETIC CHUCK are:

1—Effective utilization of the space on the face of the chuck;
2—Use of unit magnetic pole pieces of forged iron placed adjacent to each other with no neutral poles or neutral spaces between them;
3—Gaps between poles uniform throughout because adjacent edges are machined to definite dimensions;
4—Complete magnetic circuit insulated from the body of the chuck—a patented construction;
5—Machine wound coils assure uniform quality and equal ampere-turns in all;
6—Interlocking pole pieces offer transverse as well as longitudinal resistance to the work;
7—Watertight construction.

The Simmons Unit-pole magnetic chuck works where others fail, because it is designed in accordance with the principles of correct magnetic practice and gets the maximum pulling power that can be obtained in a given space. Ask for bulletin 107.

### Details of Tests

The test here shown was made on a 30-inch Gray planer equipped with a 21 x 10¼-inch T-slot Simmons Unit-Pole Magnetic Chuck. The cut was taken on a cold rolled steel bar 31 inches long, 4 inches wide and ¾-inch thick. The chip was ⅝-inch deep and $\frac{3}{16}$ inch thick. It stalled the machine.

TAFT-PEIRCE
Woonsocket, R.I., U.S.A.

**New York: Woolworth Building**
**Chicago: 6701 East End Avenue**
**Detroit: Majestic Building**
**Cleveland: 10708 Hampden Avenue**

**TAFT-PEIRCE PRODUCTS CARRIED IN STOCK BY**

**Syracuse Supply Company, Syracuse, Buffalo, Rochester**
**Cadillac Tool Company, Detroit** **Wm. M. Pattison Supply Co., Cleveland** **Sherritt & Stoer Co., Philadelphia**

# Turning Time Into Gold

The ALCHEMIST was unsuccessful in his efforts to turn the Baser Metals into Gold, but by the use of the

## Universal Angle Plate

There is no difficulty in turning TIME into GOLD and, in addition, there is no difficulty or uncertainty as to the production of exceedingly accurate work, no matter what machine it may be used in connection with.

With Worm Adjustment

12 x 18

How? You have a job requiring operations at a number of different points or angles. Ordinarily it must be reset each time. But with the Universal Angle Plate only one set up is necessary. The "Universal" swings to any horizontal angle within 360 deg. and to any vertical angle within 90 deg. It takes at least a dollar an hour out of labor and overhead.

**Proof for the asking.**

**Boston Scale & Machine Company**
**100 Ruggles St., Boston, Mass.**

## A Reputation Builder

Your reputation as a manufacturer is established by the never failing accuracy of your output. You can establish an enviable repute if you test your flat and cylindrical parts with the

**American Amplifying Gauge**

For the gauging of small machine parts it is rapid and accurate to the extreme and gives as good results in the hands of an unskilled operator as in those of an expert. Send for Bulletin "A" and see its many features.

**American Gauge Co.**
**Dayton, Ohio**

## GARVIN HEX-SQUARE TWO-WAY FIXTURE

For Butt or Straddle milling of a square or hexagon nature.

Will clamp in either a horizontal or vertical position.

Made in two sizes:

1 in. size, ¼ to 1 in. cap.
2 in. size, ¼ to 2 in. cap.

MANUFACTURED BY

**THE GARVIN MACHINE COMPANY**
**Spring and Varick Sts. 50 Years in NEW YORK CITY**

## Union Calipers

We manufacture complete line of calipers for every requirement.

Write for our handy booklet which describes "Machinists Tools of Quality" for every use in the shop.

**Union Tool Co.**
**Orange, Mass.**

## COCHRANE-BLY CO.

**10-in. Compound Circular Table**
**A UNIVERSAL PROTRACTOR**

With this device you can work from any number of centers at one setting of the work, such as required on Dies, Jigs, Templates, Cams, Etc.

**Write for Circulars and Prices.**

**Cochrane-Bly Co.**
**Rochester, N. Y., U. S. A.**

# Tycos
## TEMPERATURE INSTRUMENTS

Indicating Recording Controlling

***This General Trade Mark*** REG'D. TRADE MARK Tycos ROCHESTER, N.Y.

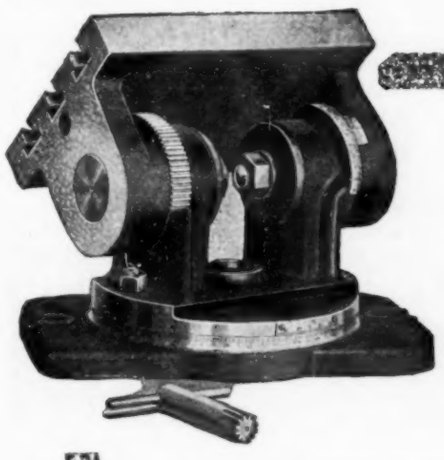
**covers all indicating, recording and controlling instruments made by this company and is a synonym for standard apparatus—precision, reliability and permanence.**

We invite, from all interested industrial managers, correspondence relating to our instruments and their uses.

Our stock models cover every usual industrial requirement, with very moderate outlay.

*Taylor Instrument Companies*
Rochester, N. Y.
*There's a Tycos Taylor Thermometer for Every Purpose*

353



Reid TRADE MARK

## Great Accuracy
## Utmost Rigidity
## No Over-Hang

The Reid Universal Angle Fixture eliminates haphazard set-ups.

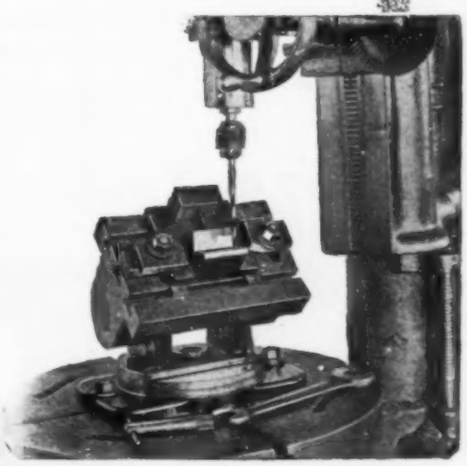
It is rigid—permits no chatter or distortion. Can be set to one-twelfth of one degree. Three sizes, 6 in. x 9 in., 8 in. x 12 in., 12 in. x 18 in.

Write for pamphlet and name of your dealer.

***Also Builders of the Reid No. 2 Surface Grinder***

**REID BROTHERS CO.**
**BEVERLY, MASS., U. S. A.**

Agent—Oliver Machinery Co., Ltd., 201-203 Deansgate, Manchester, England.



Model 310 Single-phase Portable A.C and D.C. Watt-meter.

**Weston**

**ELECTRICAL INDICATING INSTRUMENTS**

are unqualifiedly superior to any other instruments designed for the same service. A.C. or D.C. Switchboard or Portable Instruments for every field of Indicating Electrical Measurement.
In writing for catalog or bulletins, please specify the field that interests you.

**WESTON ELECTRICAL INSTRUMENT CO.**
17 Weston Ave., Newark, N. J.
Branch Offices in the Larger Cities.

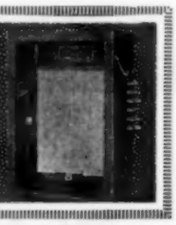
## For Checking Thread Accuracy

A simple, practical and inexpensive appliance that indicates the accuracy or inaccuracy of both internal and external threads. A check-up on the set-up of the machine, work, tap, etc.—a preventive against the waste caused by non-fitting threaded pieces. Anyone can use it. Your screw cutting operators need it.

Get the details in the "B-T" Indicator Bulletin.

**Bicknell-Thomas Company**
**Greenfield, Mass.**

## Thwing Pyrometers



High Resistance Indicating and Multiple Record Types for all industrial purposes.
Tell us your conditions and we will explain the economies or improvements that pyrometers will effect.

THWING INSTRUMENT CO.
2337 Lancaster Avenue Philadelphia, Pa.

**Jones Tachometers for all Uses**
**Hand (Portable) Tachometers**
**Stationary Tachometers**

*Write for our catalog today*

**JONES-MOTROLA, Inc.**
29 West 35th St., New York City

## GROVE INDICATING GAUGE

For measuring the inside of holes, slots, etc., with extreme accuracy. A great time saver.

*Write Today for Circular.*

**Price $2.75 Post Paid**
**GROVE MFG. CO.**
**Dayton, Ohio**

## Charles Engelhard

*the original* Le Chatelier
**Pyrometers**
30 Church St., New York City

## A Simplified Dividing Head

Our Semi-Universal saves time and expense.

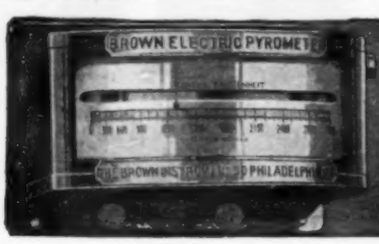
*Write TODAY for circulars and price.*

**Whiting & Comstock**
**Hartford, Conn.**

Export Dept.: 77 Broad St., New York City

WATCH FOR OUR NEXT AD. ON THE **PRESTOMETER** FLUID GAUGE

COATS MACHINE TOOL COMPANY Inc.
*110-112 West 40 Street, New York N. Y.*




**BROWN PYROMETERS**

***THE WORLD'S STANDARD HEAT METERS***

Bethlehem, Buick, Brill, Baldwins, and seven thousand other big users stand back of the world-wide success of Brown's. Write to the Brown Instrument Co., Philadelphia, or one of their district offices in New York, Pittsburgh, Detroit, or Chicago, for complete information now.

# MARK YOUR TOOLS
WITH THE

# Etchograph
Trade Mark

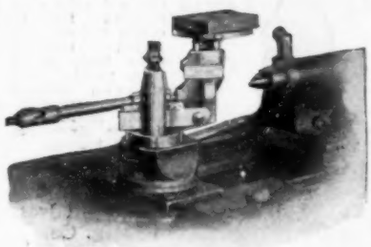
**An electric machine for marking tools and metal articles for identification purposes, etc. Requires no acid—uses only electricity—lasts indefinitely.**

***Write us today for literature and state current available.***

**William Brewster Co., Inc., 30 Church Street, New York**

Representative for Great Britain: Geo. H. Alexander, Birmingham, England.
Allied Machinery Co. of America, Overseas Representatives—Except British Isle.

## New Aid for Die Makers
## "The Boston" Filing Machine



This new vertical rotary filing machine can be attached to either a bench or engine lathe, drill press or it can be driven by electric motor or other power.
The files or spiral cutters can be made in any desired shape or taper, for making clearance in die. Laps can also be used for grinding out a hardened die.
There are other features which warrant complete investigation.
Complete details will gladly be sent upon request.

**BOSTON TOOL & MFG. CO., INC.**
**262 Dover St., Boston, Mass.**

## ARE YOU PAYING HIGH PRICED ENGRAVERS

to do your engraving work by hand? If you are the

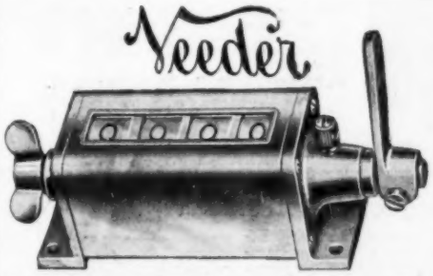
## Gorton Engraving Machine

will do the same work for you with an inexperienced boy or girl operator, at a saving of at least one-half to you. The finished work will be just as good as that done by hand too.

***Let us send samples and tell you more about this machine.***

**GEO. GORTON MACHINE COMPANY, RACINE, WIS.**

## Veeder



***Set-Back* COUNTER**

*Registers one for each throw of the lever, indicating an operation of your machine.*

A Veeder Counter indicates the output of your machine and the *attainable standard*, so the operator can keep to a rate of work that's more in keeping with the present *wage* rate. Send for booklet.

**The Veeder Mfg. Co.** 15 Sargeant St. Hartford, Conn.

Unload that extra heap of work —Unload it onto the shoulders of the man who can handle it— You can find that man in the

## CONTRACT WORK SECTION

**Scleroscope International Standard (Hardness Tester)**

## HARDNESS TESTING
**is now done almost exclusively with**
## The Scleroscope

DIRECT READING, can be operated by anyone with rapidity; measures softest metals and hardest steels without adjustment. Is the only instrument that properly agrees with others of its kind, and is used for ordering material to specification. Send for our booklet, free.

## The Pyroscope

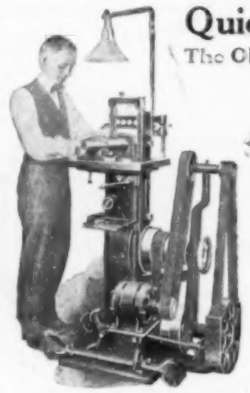
is the common-sense heat measuring instrument that makes straight for results, without fuss. It costs least of all, burns simple kerosene, never varies. It is the available trusty in the grimy hands of furnaceman, hardeners and carburizers. It is a pet in the laboratory, and preferred by colleges. Interesting bulletin free.

**SELECTIVE CARBURIZING and HARDENING**
**By SHORE PROCESS**

**Pyroscope (Temperatu.)**

## SHORE INSTRUMENT & MFG. COMPANY
**555-557 West 22nd Street, New York**

**Foreign Agents:**
Agents for Italy, Great Britain and Colonies: Coats Machine Tool Co., London, Glasgow, Newcastle-on-Tyne. Iznoskoff, Suckau & Co., Petrograd, Russia. Aux Forges de Vulcain, Paris, France. R. E. Stokvis & Zonen, Ltd., Belgium and Holland. Yamatake & Co., Tokyo, Japan.



## Quick, Accurate Filing

**The Oliver No. 404 Rearwin Die Filer**

is the product of years of experience in the manufacture of machines of this type. It is capable of doing the accurate work of a small bench machine as well as handling the largest capacity of work. **It will take any size standard or special file from a 3-inch needle up to a 12-inch bastard.** It can be used on closed top or closed bottom dies. A novice can file much more quickly and accurately with it than an expert machinist can by the ordinary hand method.

***Write for our illustrated catalog.***

**Oliver Machinery Co.**

**Grand Rapids, Mich.**

## Your Engines May Break Down Tomorrow

Why not? You have not had a chance to repair them and the terrific strain of 24-hours-a-day operation has not helped them any.

## UNDERWOOD SERVICE

will enable you to run the engine soon after the break-down. Our men are waiting for the call with tools packed.

**Send it along—day or night**
**Had "Helpful Hints?"**

**H. B. Underwood Corp.**

Philadelphia - - - - Penna.

## Why Endure Boiler Scale and Waste Coal?

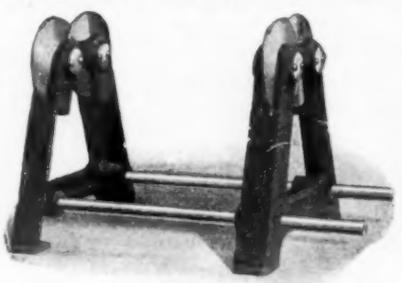
Do you realize that 1/16-in. depth of scale means a loss of from 10 to 15% in efficiency from a fuel standpoint? Get busy and call upon SOUTHER SERVICE to show you how to avoid scale and save coal.

**The Henry Souther Engineering Co.**

**Consulting Engineers**

**11A Laurel Street, Hartford, Conn.**

## The Anderson Ever Ready BALANCING WAYS



are extremely sensitive and require no adjusting. Made of quality materials, in several sizes to handle cutter heads, armatures, polishing wheels, airplane motors, propellers, crank shafts, etc. Rotation discs run on ball bearings.

**Full particulars on request.**

**Anderson Bros. Mfg. Co.**
**120 Morgan St.**
**Rockford, Ill.**

## KNOEPPEL ORGANIZED SERVICE

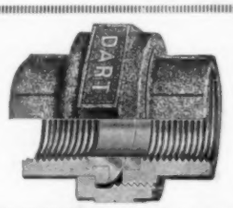
INDUSTRIAL ENGINEERS

Our service is constructive betterment applied to industrial plants, aimed to increase production, reduce costs and improve industrial relations.

Our position in our field warrants your consideration.

C. E. KNOEPPEL & CO., Inc.

Six East Thirty-ninth Street, New York, N. Y.




**Pointing to the Reason of a Permanent Tight Connection**

**←BRONZE TO BRONZE**

The Dart Union has two bronze seats in the vital part, perfectly ground, that will not corrode. Requires no packing. *May we send you a free sample and our Illustrated Catalog?*

**E. M. Dart Mfg. Co., Providence, R. I.**

The Fairbanks Co., Sales Agents
Canadian Factory Dart Union Co., Ltd., Toronto

**BLEVNEY TWO-BELT**

## Abrasive Finishing Machines

*Cut the Cost of Finishing Metals, Fiber, Rubber, Etc.*

The Blevney Patent Two-Belt Polishing and Finishing Machines increase production from 40 to 100 per cent or more. They eliminate chatter, round edges, chips, and a large stock of wheels. Can be operated by unskilled workmen.

**Send for booklet today.**

**Blevney Machine Company, Greenfield, Mass.**

## There is nothing better than the Best

To secure 100% Economy and 100% Efficiency, use W. N. Best oil and tar burners and furnaces for Annealing, Case Hardening, Tempering, Forging, Heat Treating, etc. Send for Catalog.

**"There is nothing better than the Best"**

**W. N. BEST, Inc., 11 Broadway, N. Y. City**

## START TO ECONOMIZE

It costs considerable to replace lost and ruined tools. Get a "Gerstner" Case and you'll be money in at the end of the year. Select one from our free catalog showing many styles of guaranteed Tool Cases. **Write for Catalog.**

J. Gerstner & Sons. Manufacturers of Mechanics' High Grade Tool Cases

**25-31 Columbia St., DAYTON, OHIO**

## Coil Springs for Every Requirement

**Extension—Compression—Torsion—Wire Spring Special Wire Forms**

Acquaint us with your problems, thereby making use of our many years of experience.

**Charles A. Cook & Co., Inc.**
**3909 Second Ave., Brooklyn, N. Y.**

**Products from DIES and MOULDS made by the**

**KME AUTOMATIC MACHINE METHOD**

KELLER MECHANICAL ENGRAVING COMPANY
**76 Washington St., Brooklyn, N. Y.**

**To Prepare Steel for Painting**
—PEOXIDINE removes oil, rust, hand marks—makes the paint hold firmly, and prevents developments of defects in the finish.

**Rustless Pickle for Iron and Steel**
—DEOXYLYTE prevents pickled iron or steel from rusting under the paint.

**To Make Paint Stick to Galvanized Iron**
—LITHOFORM forms a chemical coating which acts as a binder between the paint and the galvanized iron.

**AMERICAN CHEMICAL PAINT CO.**

**Philadelphia New York Detroit**

# Knock in the Head of an Empty Oil Barrel

***and note the amount of oil you find—***

it will surprise you to learn that from a pint to a gallon remains. Multiply this quantity by the number of barrels used in your plant per year. Now figure the cost in dollars and cents. This is needless waste and expense.

Why pay for this oil and then send it back in the supposedly empty barrels?

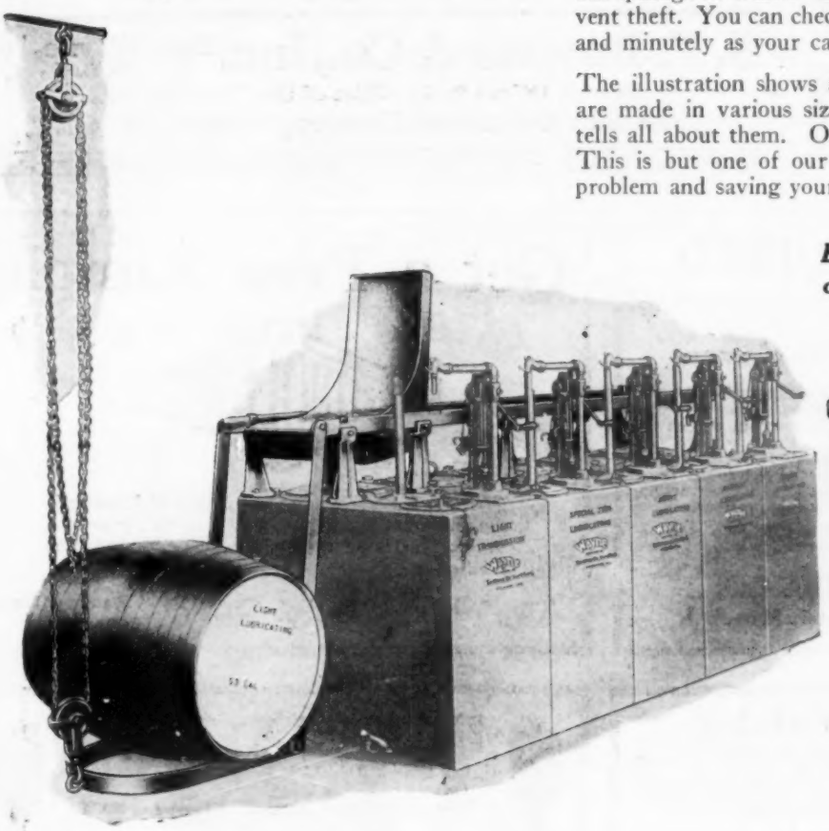
You cannot drain all the oil from a barrel through a spigot. The best possible way is through the bung. Once a spigot is put into the barrel head the returnable value of the barrel is lessened.

Spigots leak and permit spillage. Spillage means oil-soaked floors. Oil-soaked floors are a fire menace and cause high fire insurance rates.

Tin can measures collect dirt, dust and sediment. These mixed with oil form grit. Grit ruins bearings.

Take your oil barrels, empty them through the bung into steel dirt and dust-proof tanks. One man can easily handle a barrel with the small chain-hoist. Roll them over the manhole and allow the oil to drain completely out of the barrel. A single turn of the crank on the pump gives an accurately measured quantity, instantly and without spillage or waste. Locks on both pump and tank prevent theft. You can check your oil consumption as quickly and minutely as your cash.

The illustration shows a battery for various oils. They are made in various sizes and models. Bulletin 65AM tells all about them. Of course, it is free for the asking. This is but one of our many methods for solving your problem and saving your oils and other liquids.



***Every day you delay your oil wastes away. Wayne Systems stop waste.***

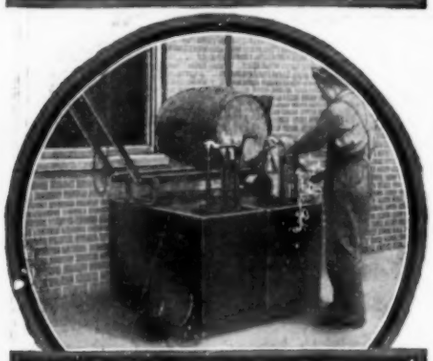
**Wayne**

**Liquid Storage Systems, Oil Filtration Systems, Oil Burning, Metal Melting, Metal Forging and Heat Treating Furnaces.**

## WAYNE OIL TANK AND PUMP CO.

**507 Canal Street, Ft. Wayne, Ind.**

Tiresome, Expensive, Dangerous, Wasteful—but Unnecessary.



With Bowser Equipment One Man Does the Work with Less Time and Effort —and Without Loss.

# STOP WASTING LABOR IN HANDLING OILS

Do away with the back-breaking, disagreeable labor in storing and handling oils.

With Bowser Storage Equipment the heavy work is done mechanically—there is no wasted energy—all oils are easily and quickly put into storage by gravity.

## Save With BOWSER Systems

Distribution is done by accurate, rapid self-measuring pumps—no oils are left in shipping containers to dry up, leak and seep away—none is lost through spilling or dripping faucets. Every operation in the use of oils is done in a systematic, safe and saving manner.

*Write us for literature, showing why Bowser Systems are a paying investment*

**S. F. Bowser & Co., Inc.** Fort Wayne, Ind. U. S. A.

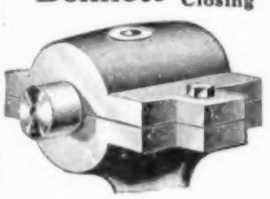
**Branch Offices in 21 Cities of the United States.**

**Canadian Office and Factory, TORONTO, ONT.**

## NO TAPS REQUIRED

To install this handy oil hole cover you merely drill a hole of the proper size and force it into position.

### Bennett Self Closing Oil Hole Covers



are neat in appearance and positive in action. To fill, you merely press spout of oil can on the valve. Upon removal of spout, cover automatically closes and prevents entrance of dust or grit. Three part construction assures long, lasting service.

**Catalog A-1 will help you in choosing—send for it right now.**

**BAY STATE STAMPING CO.**

**380 Chandler Street, Worcester, Mass.**

## Get a Free Sample

W & B MINOLARD

Write in for a free sample quantity of Minolard, the universal Cutting Oil. A trial will prove its value. Just send us a postal today for the *free trial quantity.*

The White & Bagley Co., Worcester, Mass., U. S. A.

## Send For The Gem Catalog

Every shop foreman and worker should know about "Gem" Cost Reducers.

Then, when work piles up, suggest the "Gem" because the "Gem" eases up things in a wonderful way. Send for your copy now.

**Gem Manufacturing Company**

**Goebel and Fulton Sts., N. S. Pittsburgh, Pa.**

English Agents—A. A. Jones & Shipman, New Century Works, Leicester, England.

KEYSTONE OF GEM GUARANTEE GOOD QUALITY TRADE MARK

## EMPRESS

**OIL AND GREASE CUPS**

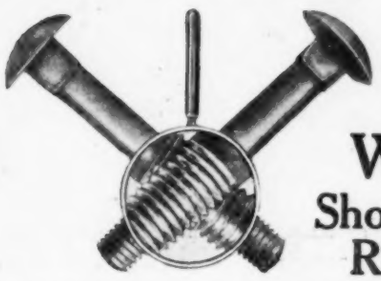
**Bowen Products Corporation, Auburn Division**

**Successor to Bowen Manufacturing Company**

**AUBURN, N. Y.**

***Catalog "H" on Application***

# Magic SOLUBLE OIL



## Which Shows Your Results?

Compare the threads on the bolts shown in these two actual photographs. Those—on the left—were made on a machine using a well-known cutting oil with a mixture of 4 lb. Soda Ash to 16 parts water and 1 part oil. The die ran only 27 hours. The threads are ragged and rough.

The photograph on the right shows threads made on the same machine using Magic Soluble Oil with a mixture of 24 parts water to one of oil. (The die ran 90 hours.) These threads are smooth and even.

Magic Soluble Oil is daily proving in hundreds of representative shops that it improves and increases factory outputs. Barrel sent on approval.

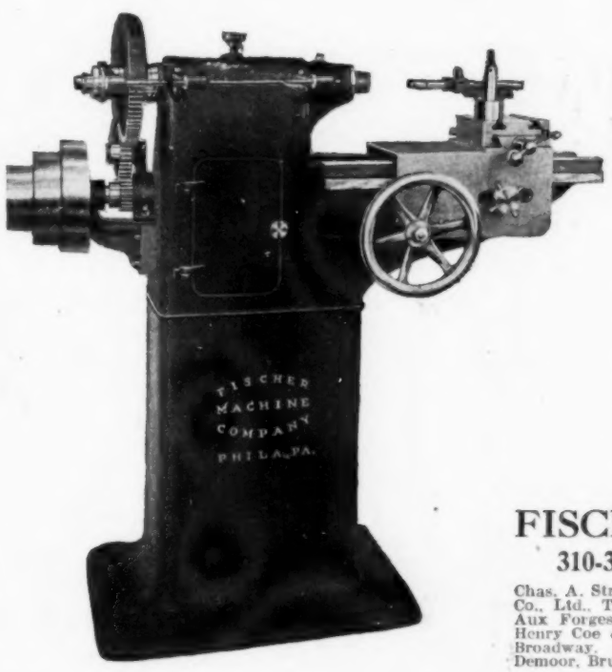
**Fiske Bros. Refining Company, 24 State St., N. Y. City**

*Manufacturers of the Well-Known*

*MAGIC CUTTING COMPOUND and CLIMAX MINERAL LARD OIL*

Factories: Newark, N. J., Toledo, Ohio Branches in Large Cities

# Read what Carlyle-Johnson Mach. Co. said about the Fischer Oil Grooving Machine




"We are manufacturers of the well-known Johnson Friction Clutch and are pleased to advise you that our clutch hubs are being spiral grooved on a Fischer Oil Groover which is SAVING US CONSIDERABLE MONEY over our other type of equipment."

## FISCHER MACHINE COMPANY

**310-316 No. Eleventh St., Philadelphia, Pa.**

Chas. A. Strelinger Co., Detroit, Mich. Foreign Agents: Coats Machine Tool Co., Ltd., Thanet House, Strand, London, Glasgow and Newcastle-on-Tyne. Aux Forges de Vulcain, Paris, France. Yamatake & Co., Tokyo, Japan. Henry Coe & Clerici, Milan, Italy. Allied Machinery Co. of America, 120 Broadway, New York, for Switzerland, Spain and Portugal. Ateliers Demoor, Brussels. Chr. A. Herstad, Norway, Sweden, Denmark and Finland.

# Protect Your Products Against Rust

In these days of costly equipment, finishes which tend to lengthen the life of your product gain good will for you. Rust, the great destroyer, can be prevented from ruining your goods by giving them a moisture proof, wear resisting finish.

What precautions are you taking against rust? Can you afford not to gain the good will which good surface protection gives?

HILO

# Enamels and Japans

are made to withstand moisture and wear.

The following are typical of a broad variety of Hilo Rust Resisting Finishes for products of both wood or metal.

| | |
|---|---|
| 903 A. D. Gloss Enamel<br>911 A. D. Rubber Enamel | Are Oil Proof Machinery Finishes |
| 1528 White Enamel Undercoat<br>1542 Gloss White Enamel | For Sanitary Equipment |
| 936 Black Finishing Undercoat<br>934 Finishing Black Baking Japan | For Office Equipment |
| 927 Improved Rubber Baking Japan<br>942 Dull Rubber Baking Japan. | For Castings, General Hardware, Auto Lamps, etc. |

Hilo Service Salesmen, long trained in solving paint problems, are at your service to help you obtain a finish that will save the surface of your products. A request to have the Hilo Salesman call will meet with a prompt response.

***Bulletin No. 1 describes Black Enamels and Japans. Bulletin No. 3 describes White Enamels. Send for them today.***

HILO

## Varnish Corporation

Formerly Moller & Schumann Co.

1 Gerry St., Brooklyn, N. Y. Chicago, Ill.

Pacific Coast Distributors:

The Brininstool Co., Los Angeles, Cal.

## GITS OIL CUPS

Give perfect satisfaction where others fail. State style and size in which you are interested, and we will send free samples and catalog.

**Gits Bros. Mfg. Co.**

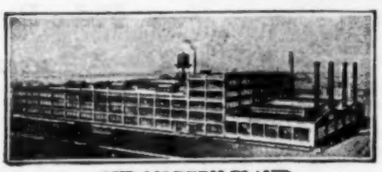
1940 S. Kilbourne Ave., Chicago

## Michigan Lubricator Co.

**Detroit, Michigan**

**Michigan Oilers and Michigan Grease Cups** insure efficient lubrication. Used by leading engine and machine tool builders for the past 30 years

***Prices and Printed Matter on Application***



MA-28 OUR MODERN PLANT

## OAKITE CLEANS

*Our business is to solve your cleaning problem Put it up to us!*

OAKLEY CHEMICAL CO

24 THAMES STREET NEW YORK

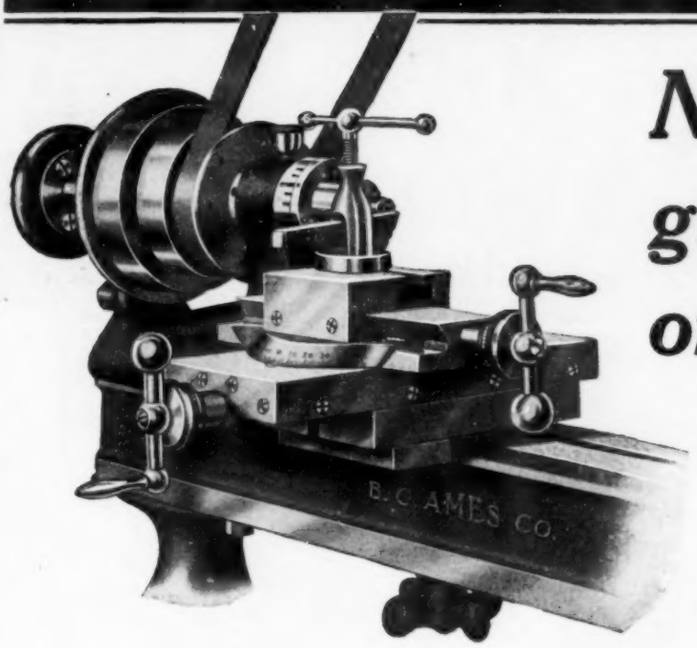
## Tucker Oil Hole Covers

on your product is a message to your customers that your machines are equipped with high grade goods—and were attached for practical and utility purposes.

*Send for Oiler Catalog No. 6.*

**W.A. & C.F. TUCKER, Hartford, Conn., U.S.A.**

FOREIGN AGENTS: Fenwick Freres & Co., Paris, France. C. W. Burton, Griffiths & Co., London, Eng.




# *Notice features giving accuracy on this toolrest*

B.C. AMES CO
WALTHAM MASS. U.S.A.

# The Ames Bench Lathe

combines the best quality of materials with a proven engineering skill in such a way as to result in a product that will give everlasting satisfaction.

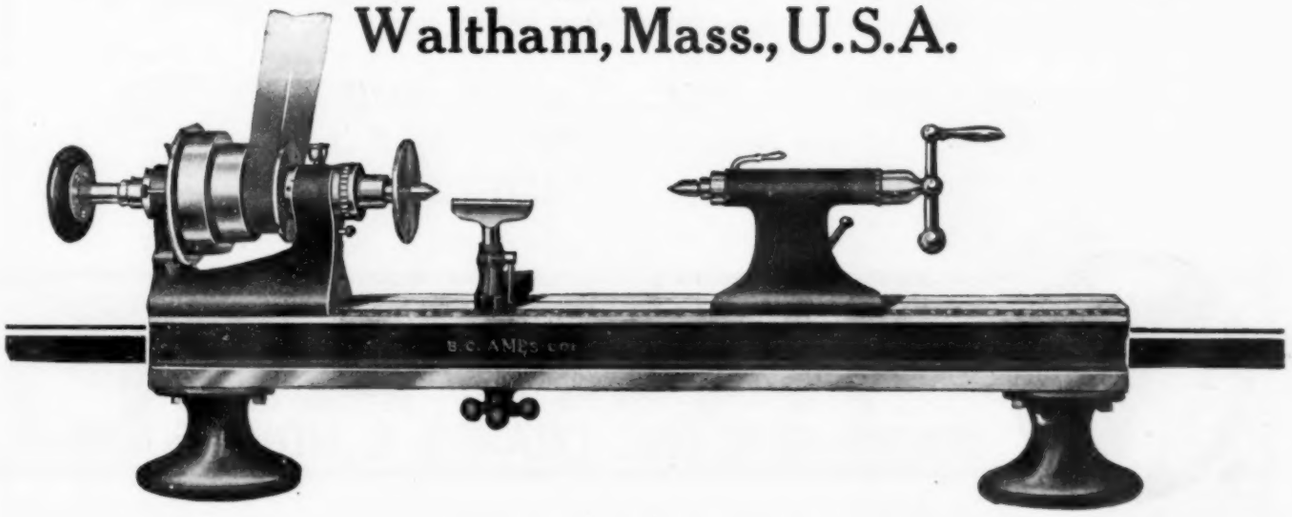
For accurate quantity production of delicate parts no machine can be found that will surpass the Ames in turning, grinding, drilling, threading, etc.

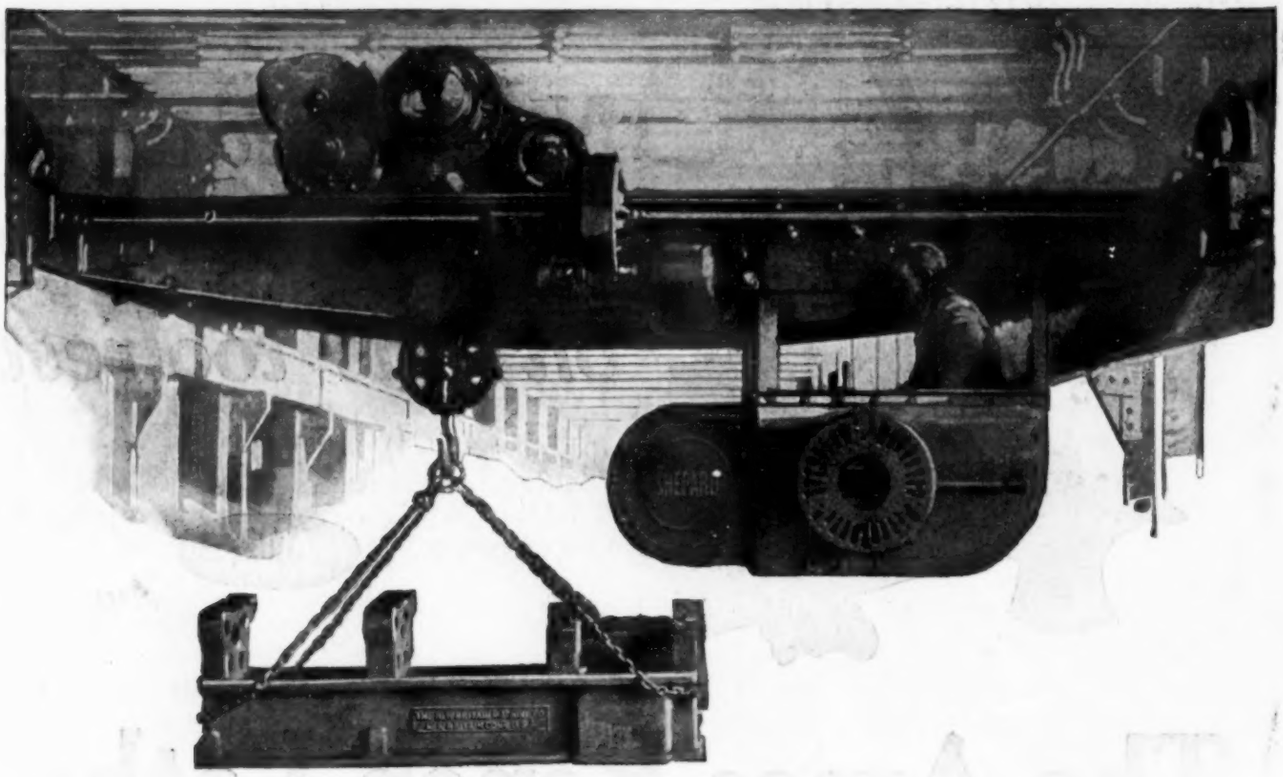
The Ames is a success even when handled by unskilled operators as has been proven time and again in big plants all over the country.

If you are in the market for a tool of this kind we ask that you compare the Ames product with all others before making your decision.

## The B. C. Ames Company

## Waltham, Mass., U.S.A.





# COMPACT

Where headroom is limited, and heavy pieces must be moved quickly and carefully, the most efficient, economical and convenient method of handling is by SHEPARD ELECTRIC CRANES AND HOISTS. The saving in labor is increased by the fact that a "Shepard" does not need a skilled operator. And the dust-proof, damp-proof, "fool-proof," enclosed unit construction, with its assured thorough lubrication which is a distinguishing feature of all Shepard Electric Hoists and Cranes, means trouble-free service with the least maintenance expense.

Shepard Electric Cranes and Hoists are built to capacities of from 1 to 30 tons. There is some one of the many types which can be specialized to meet exactly your individual hoisting conditions.

***Accept the co-operation of our engineers, who will be pleased to submit recommendations. Our Handbook will also be of interest.***

## SHEPARD ELECTRIC CRANE & HOIST CO.

**352 Schuyler Avenue, MONTOUR FALLS, N. Y.**

**New York Philadelphia Chicago Pittsburgh Boston Baltimore Cleveland San Francisco Montreal Melbourne London**

*Member Electric Hoist Manufacturers Association*

2015-S

REG. U.S. PAT. OFF.

SHEPARD
ELECTRIC CRANES & HOISTS

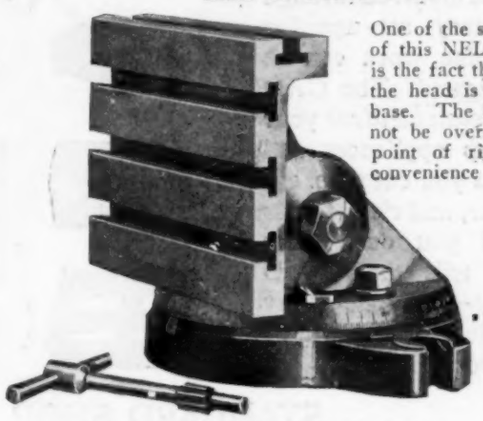
# NELSON

## Correct Design Angle Plates and Fixtures

**The only Angle Plates and Fixtures made with a Second Face and T-slot**

### NELSON Universal Angle Fixture

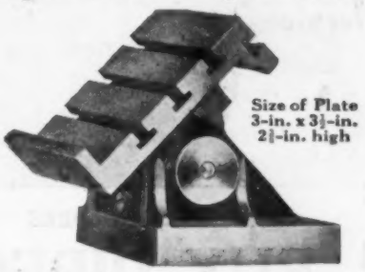
**Size of Plate 6 x 9**



One of the superior features of the design of this NELSON adjustable angle fixture is the fact that no matter in what position the head is set it does not overhang the base. The importance of this point cannot be over-emphasized from the standpoint of rigidity and compactness and convenience on closed housing machines. Here are some of the other mechanically right features: hardened adjustable stops for the exact horizontal and vertical positions; large clamping surfaces insuring permanent setting in any position; auxiliary clamp holds the setting so that it is not thrown off when tightening up the clamping nuts.

**You will like these fixtures on sight.**

### NELSON Toolmakers Adjustable Angle Plate



**Size of Plate 3-in. x 3½-in. 2¾-in. high**

Here is a toolmaker's Angle Plate with all the NELSON features of correct design. Guaranteed accurate in every way, all working surfaces being ground. Its stability and usefulness for toolmakers is impressed on you at first glance. $10.00 postpaid anywhere in U. S. A.

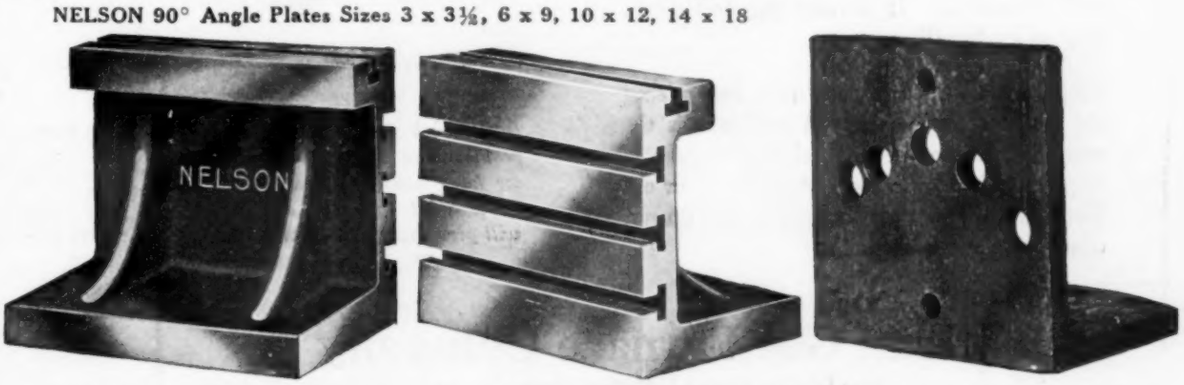
### NELSON Large Adjustable Angle Fixture

This large NELSON Angle Fixture—the largest adjustable angle fixture made—is the result of a demand for NELSON correct design in a big plate. Have you ever felt when you looked at a piece of equipment that it was mechanically right—correctly proportioned, well balanced, well made, just what you want for your work. This new NELSON Angle Fixture appeals to your mechanical instinct the minute you look at it. Its center of Gravity is low and the head never overhangs the base making it particularly stable and rigid. The head is operated by a worm making possible the finest adjustments. The clamping bolt is 6 inches off center, insuring positive holding in any position. Made in 3 sizes, 7½ x 9, 10 x 12 and 14 x 18, with numerous other convincing features we would like to tell you about.

*Write today for literature.*

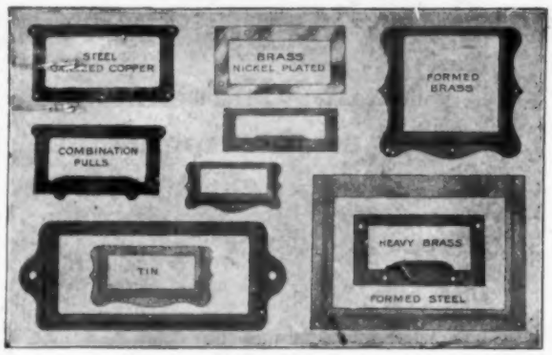
Here is a line of NELSON solid 90° Angle Plates with a second face and T slot that will increase your production, cut your labor costs and reduce your scrap heap. The old method of taking a solid plate and drilling holes in it for different set-ups is a make-shift at best and the time and money wasted in drilling the holes is inexcusable. Get these accurate, ready-to-use NELSON plates. Be progressive.

**NELSON 90° Angle Plates Sizes 3 x 3½, 6 x 9, 10 x 12, 14 x 18**




## NELSON TOOL & MACHINE CO., Newark, N. J.

KALES STAMPINGS




CARD HOLDERS

BUY DIRECT

We manufacture 23 different styles of card and bin tag holders and pulls.

SAVE TIME AND ANNOYANCE by using Kales Card Holders to properly classify your stock, so you can find what you want when you want it.

*Send for our Catalogue and Price List*

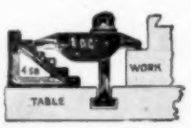
KALES STAMPING COMPANY

453 West Lafayette Blvd., Detroit

CAD

Standardized set-up appliances

The time lost, the risk involved, and the expense incurred through ordinary set-ups for machine work can be eliminated. The CAD line *standardizes* your set-up appliances and helps you cut time, expense, and risk. Let us send you our folder that tells the CAD story — it's one every production man will be interested in.




STANDARD SHOP EQUIPMENT CO.

*Set-up appliances for machine tools*

801 Real Estate Trust Bldg.

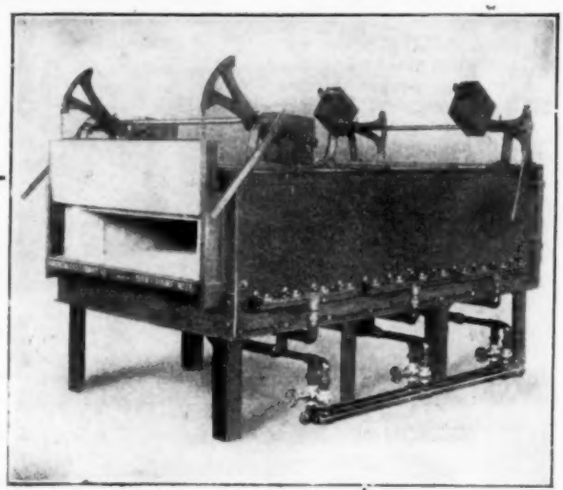
PHILADELPHIA, PENNA

# Coal Shortage

THE users of coal as a heat treating fuel can no longer continue in the error of their ways on the plea of economy Coal is scarse and its price exorbitant.

Spoiled work is a common product of the coal treatment. It further requires extra help in its handling.

Modern manufacturers are daily recognizing the gas treated product and realize it is the most uniform and economical even if its cost to produce is a trifle above that of coal or oil. You are heat treating at a loss if you do not employ American methods.



*Don't think your heat treating problems are harder than others we have handled. Just let us know what they are and we will give you expert advice.*

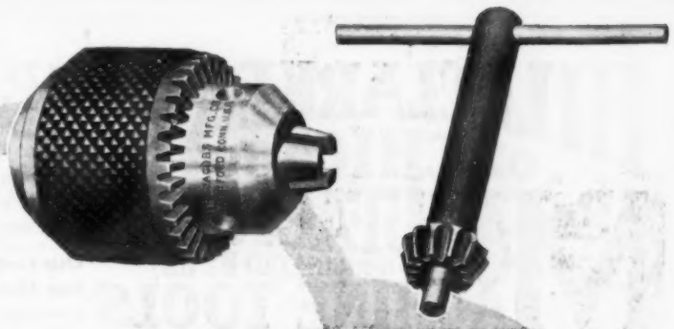
Oven Furnace No. 81 with front and rear entrance. Available heating space, 9½ in. high, 41 in. wide, 91 in. long. Entrance, 9¼ x 41 in.

American Gas Furnace Company

Gas Engineers and Manufacturers

24 and 26 John Street, New York

# Jacobs Chucks



The Hisey-Wolf Machine Company of Cincinnati, Ohio have built up an enviable business on the record of their quality tools.

"Hisey" drills stand high in the estimation of experienced buyers of portable electrics.

Jacobs Improved Drill Chucks are used as regular equipment on all "Hisey" Drills. "Hisey" is a name to be protected, therefore—Jacobs Improved Drill Chucks.

## The Jacobs Mfg. Co.

Dept. A.M.

Hartford Connecticut

U-S-A-

## JACOBS CHUCKS

"Hisey" are standard equipment on

PORTABLE ELECTRIC
HAND and BREAST DRILL

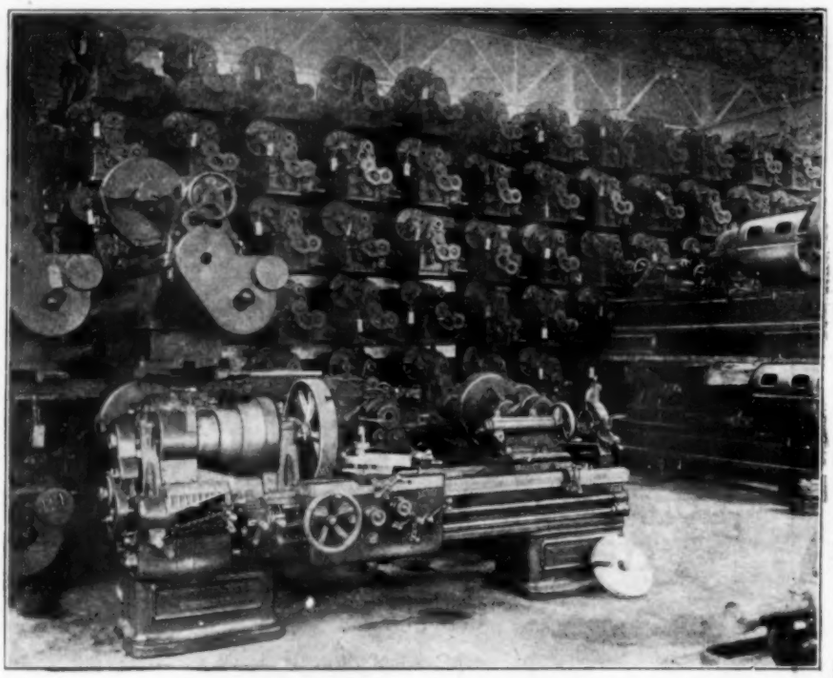
# HILL, CLARKE & CO. OF CHICAGO

# Re MANUFACTURED MACHINE TOOLS

-(ORIGINATED BY US)-

WE are filling our warehouse full to the roof with just such tools. We can secure these machines at bargain prices, where you or other dealers cannot, because we have the cash to buy outright, and the space to store complete equipments, regardless of how large. These tools are then re-manufactured in our own plant, so that in many respects they are even better than new.

**Our re-manufactured tools are so good and the price so low that you cannot afford to buy a new tool when a re-manufactured one is available.**



**113—20-in. American Lathes in this pile.**

### LATHES

1—14-in. x 6-ft. Reed Engine, C.R.
42—14-in. x 6-ft. Reed Ex. Hvy. Pl. Tng.
7—16-in. x 6-ft. Reed Engine, C.R.
1—16-in. x 6-ft. Reed Engine, C.R., Q.C.G.
1—16-in. x 7-ft. Reed Engine, C.R.
14—17-in. x 6-ft. LeBlond Rapid Production, C.R., Q.C.F.
10—17-in. x 6-ft. LeBlond Engine, C.R., Q.C.G.
8—17-in. x 8-ft. LeBlond Engine, C.R., Q.C.G.
21—18-in x 8-ft. Boye & Emmes Engine, D.B.G., C.R.
8—18-in. x 8-ft. Boye & Emmes, D.B.G., C.R., Q.C.G.
20—18-in. x 8-ft. LeBlond Engine, D.B.G., C.R., Q.C.G.
1—18-in. x 8-ft. Lodge & Shipley.
3—18-in. x 8-ft. American Engine, D.B.G., C.R., Q.C.G.
65—19-in. x 8-ft. LeBlond Engine, D.B.G., C.R., Q.C.G.
35—19-in. x 8-ft. LeBlond Engine, D.B.G., C.R., Q.C.G., P.F.T.
17—20-in. x 8-ft. LeBlond Engine, D.B.G., C.R., Q.C.G.
17—20-in. x 8-ft. American Engine, D.B.G., C.R., Q.C.G., P.F.T.
113—20-in. x 8-ft. American Engine, D.B.G., C.R., Q.C.G.
2—21-in. x 8-ft. LeBlond Engine, D.B.G., C.R., Q.C.G.
58—21-in. x 10-ft. LeBlond Engine, D.B.G., C.R., Q.C.G.
14—25-in. x 10-ft. LeBlond Engine, D.B.G., C.R., Q.C.G.
3—26-in. x 12-ft. Wickes Engine, D.B.G., C.R., 3 Q.C.G.
33—26-in. x 10-ft. Niles Engine, D.B.G., C.R., Q.C.G.
3—26-in. x 12-ft. Putnam Motor Driven Engine, C.R., Q.C.G.
75—26-in. x 10-ft. Bridgeford Engine, D.B.G., C.R., Q.C.G.
30—26-in. x 12-ft. Bridgeford Engine, D.B.G., C.R., Q.C.G.
16—26-in. x 14-ft. Bridgeford Engine, D.B.G., C.R., Q.C.G.
7—26-in. x 16-ft. Bridgeford Engine, D.B.G., C.R., Q.C.G.
10—26-in. x 18-ft. Bridgeford Engine, D.B.G., C.R., Q.C.G.
5—26-in. x 20-ft. Bridgeford Engine, D.B.G., C.R., Q.C.G.
9—30-in. x 11-ft. American Geared Hd. Engine, C.R., Q.C.G.
3—30-in. x 15-ft. American Geared Hd. Engine, C.R., Q.C.G.
3—30-in. x 20-ft. American Geared Hd. Engine, C.R., Q.C.G.
3—32-in. x 12-ft. Pittsburgh Engine, D.B.G., C.R., Q.C.G.
6—10-in. x 12-ft. Fifield Engine, Trip. Gd., C.R.
4—10-in. x 18-ft. Fifield Engine, Trip. Gd., C.R.

### UPRIGHT AND RADIAL DRILLS

1—3 spdl. Allen Sensitive.
2—4 spdl. Allen Sensitive.
1—34-in. Barnes Sliding Head.
1—No. 25 Foote-Burt.
3—3-ft. American Sensitive.
1—3-ft. Fosdick Plain.
1—5-ft. Putnam.

### GRINDERS

3—10-in. x 36-in. Norton Plain.
1—10-in. x 50-in. Norton Plain.
3—12-in. x 24-in. Modern Plain.
1—12-in. x 42-in. Cincinnati.
1—No. 1½ Bath.
1—No. 22 Brown & Sharpe Internal.
1—36-in. Pratt & Whitney Vertical.

### MILLING MACHINES AND GEAR CUTTERS

1—No. 20 Oesterlein Univ.
3—No. 1A Brown & Sharpe Univ.
1—No. 1½ Brown & Sharpe Plain.
1—No. 2A Brown & Sharpe Univ.
1—No. 2A Hendey Univ.
1—No. 2G Hendey Univ.
1—No. 9 Kempsmith Plain.
1—No. 5 Becker-Brainard Plain.
1—No. 4 Becker-Brainard.
2—No. 3—26-in. Brown & Sharpe Gear Cutters.
3—No. 3—36-in. Brown & Sharpe Gear Cutters.

### PLANERS

1—24-in. x 24-in. x 6-ft. Hamilton.
1—30-in. x 30-in. x 8-ft. Ohio.
1—30-in. x 30-in. x 10-ft. Gray.
1—36-in. x 36-in. x 10-ft. Whitcomb, 2 hds.
1—36-in. x 36-in. x 10-ft. Cincinnati, 2 hds.
1—36-in. x 36-in. x 17-ft. Powell, 2 hds.
1—48-in. x 48-in. x 18-ft. Sellers Spiral, 1 hd.
1—76-in. x 48-in. x 18-ft. Woodward & Powell, 2 hds.

### TURRET AND SCREW MACHINES

1—12-in. Foster-Kimball.
2—16-in. Pratt & Whitney.
10—21-in. Gisholt Turrets.
1—24-in. Warner & Swasey Chucking.
1—24-in. Foster Turret.
2—24-in. Steinle.
14—No. 3-A Warner & Swasey.
19—No. 2-A Warner & Swasey.

### BORING MACHINES

1—Beaman & Smith Horizontal Cy. Boring 2 spindle.
1—2½-in. Cleveland Horizontal.
1—3¼-in. Binsee Horizontal.
1—3¾-in. bar Barret Cylinder.
1—4-in. Niles Horizontal.

### MISCELLANEOUS

1—7½-in. Nutter-Barnes Cold Saw.
2—2 spdl. Pratt & Whitney Profilers.
1—No. 2 Nazel Air Hammer.
1—No. 3 J. N. LaPointe Broaching Mach.

## OUR GUARANTEE:

YOUR MONEY BACK IF YOU RETURN MACHINE WITHIN 30 DAYS OF DATE OF SHIPMENT, FREIGHT PREPAID

NO EXCUSES NECESSARY!

**649 Washington Boulevard, Chicago, Ill.**

# *ATTENTION*

# Machine Shop Equipment

### LATHES

14-in. x 5-ft. Reed, R & F.
14-in. x 6-ft. Reed, R & F.
14-in. x 6-ft. Rockford QCG.
20-in. x 14-ft. Reed, QCG.
No. 2 American Fox Brass Lathe.
20-in. Reed Chucking Lathe.

### SCREW MACHINES

No. 52 National Acme ¾ in.
No. 53 National Acme 1 in.
No. 55 National Acme 1⅝ in.
No. 3 Wood Tilted Turret, Plain head PF.
2¼-in. x 24-in. J & L, single pulley drive, Bar.
21-in. Gisholt.

### DRILLS

1-Spdl. Allen BB Sensitive.
2-Spdl. Allen BB Sensitive.
3-Spdl. Allen BB Sensitive.
4-Spdl. Allen BB Sensitive.
4-Spdl. Henry & Wright BB Sensitive.
20-in. Wheel & Lever.
24-in. Hoefer Sliding Head.
26-in. Hoefer Sliding Head.
3-ft. Taylor & Fenn Radial-Sensitive.
6-ft. Newton.

### GEAR CUTTERS

No. 3-A Cincinnati.
48-in. x 10-in. Brown & Sharpe.

### GRINDERS

Greenfield Cutter and Reamer.
No. 2 Norton Tool and Cutter.
No. 1 Landis Universal.
No. 1 Brown & Sharpe Universal
No. 2 Brown & Sharpe Universal.
No. 2 Morse Plain.
10-in. x 36--in. Landis Self-Contained.
10-in. x 72-in. B & S Plain.
16-in. x 48-in. Diamond Horizontal Surface.
No. 2½ Bath Universal, Abrasive Surface.

### MILLING MACHINES

Becker Heavy Hand.
10 x 28 Bristol Vertical.
No. 1 Standard Vertical.
No. 13 Garvin Plain.
No. 21 Garvin Plain.
No. 1 B & S Plain.
No. 3 Cincinnati Plain.
Type A Gooley & Edlund.

### PRESSES

No. 5 Standard Embossing.
No. 2 Standard Broaching and Drawing.
No. 68-N Bliss, Roll Feed.
60½ Bliss Reducing.

### DROP HAMMERS

50-lb. Standard Plain.
100-lb. Standard Plain.
125-lb. Standard Plain.
150-lb. Standard Plain.
200-lb. Standard Automatic.
300-lb. Standard Plain.

### PLANERS

16 x 16 x 3 P & W.
24-in. x 24-in. x 6-ft. Putnam.
30-in. x 30-in. x 10-ft. Powell.
36-in. x 36-in. x 12-ft. Powell. Pond.
48-in. x 60-in. x 12-ft. Niles Bement Pond.

### SHAPERS

15-in. Potter & Johnston.
15-in. Kelly.
16-in. Kelly.
20-in. Kelly.
20-in. Ohio.
20-in. Smith & Mills Plain.
24-in. Walcott.

### MISCELLANEOUS

No. 4B Cochrane & Bly Cold Saws.
3-in. x 5-in. Jewelers Rolling Mills. Mills.
⅞-in. Grant Riveting Machine.

# BROWNELL
## MACHINERY CO.
**PROVIDENCE. R. I.**

# NORMAL TIMES——NORMAL PRICES

### CRANE

10 ton Pawling & Harnischfeger Electric Traveling Crane, 60 ft. span, 3 motors, D.C., 35 ft. lift.

### HAMMERS

250 TON MESTA STEAM HYDRAULIC QUICK ACTING FORGING PRESS.
1500 lb. BLISS Board Drop.
1500 lb. UNITED ENGINEERING CO.'S Board Drop.
800 lb. MERRILL Board Drop.
300 lb. BRADLEY Helve.
80 lb. BRADLEY Helve.
80 lb. YEAKLEY Pneumatic.
60 lb. Bradley Helve.

### PUNCHES AND SHEARS

BETTS PUNCH, 20 in. gap, capacity 1 in., thru 1 in.
CLEVELAND PUNCH, 19 in. gap, capacity ⅝ in., thru ⅝ in.
HENRY PELS COPING MACHINE, armor plate, capacity 10 in. beam.
BEMENT HORIZONTAL PUNCH, 60 in. gap, main gear 72 in. x 7 in.; weight about 30,000 lb.; capacity 1½ in., thru 1½ in.

### PRESSES

No. 512 Bliss, 33 tons working pressure.
DD4 Ferracute, roll feed, weight 6,000 lbs.
No. 540 Max Ams, geared, weight 6,000 lb.
No. 1 Bliss straight sided, geared, 14 in. stroke.
No. 6 Farrel straight sided, geared, 5 in. stroke.
No. 81 Ferracute, geared, 3 in. stroke.

### VERTICAL BORING MILLS

14 ft. STANDARD, 2 swivel heads.
10 ft. HILLES & JONES, single head.
90 in. POND, 2 swivel heads.
60 in. NILES-BEMENT-POND; 2 swivel heads, heavy, latest.
72 in. BEMENT, single head.
38 in. BAUSH, 2 swivel heads.
38 in. BULLARD 2 swivel heads.

### MILLING MACHINES

No. 3 Hendey Plain, geared fexas.
No. 2 Hendey Plain.
No. 2½ Garvin Universal.
Newton Vertical, heavy duty, 36 in. cutter head.
Hilles & Jones Vertical, 24 in. rotary table.
Brainard Slab Miller, 76 in. x 36 in. x 12 ft. housings adjustable to 54 in.
2 Farrel Foundry vertical, table 20 x 36 in. (rotary table 24 in.), weighs 8000 lb.

### PLANERS

60 in. x 48 in. x 29 ft. Gleason, 3 heads.
48 in. x 36 in. x 10 ft. Ohio, 2 heads.
42 in. x 42 in. x 12 ft. Pond, 2 heads.
36 in. x 36 in. x 12 ft Cincinnati, 2 heads.
30 in. x 30 in. x 14 ft. FLATHER, 2 heads.
90-in. x 90-in. x 25-ft. Farrel Foundry & Machine Co.'s Planer, 2 heads on cross rail
30-in. x 30-in. x 10-ft. Bement Miles Planer, 2 heads on cross rail.
No. 2 Fitchburg Traveling Head Shaper, 18-in. stroke.

### LATHES

52 in. x 22 ft. Woodlite, triple geared, face plate drive, etc.
50 in. x 16 ft. Fifield.
48 in. x 20 ft. Gleason.
42 in. x 21 ft. New Haven.
28 in. x 12 ft. Fay & Scott.
Five (5) Fay Automatic Lathes, 22 in. swing, 6 ft. bed.
20 in. x 8 ft. Lodge & Shipley, geared head.
16 in. x 8 ft. Reed Prentice, new, latest type.

### SLOTTERS

30 in. Bullard Draw Cut.
Ames Combination Drill and Slotter, drills 54 in., slots 20 in.
10 in. New Haven, circular table.
Morton Portable, 6 ft. stroke, 12 ft. travel of head on base.

### GRINDERS

No. 5 Bath Duplex complete, good as new.
No. 2½ Bath Universal, complete.
Hammett Vertical, internal and external, complete.
No. 3 Brown & Sharpe, surface table 14 in. x 80 in.

**NOTE—We have over 500 MACHINES to select from, all at our warehouse ready for immediate delivery, condition guaranteed.**

## GRAVES MACHINERY EXCHANGE

Warehouse and R.R. Siding { Johnston Ave., and Monitor St., Jersey City, N. J.

Offices: { Suite 482, 50 Church St. New York City New York

Telephone Cortlandt 665

# SPECIAL OFFERINGS

### BIG BARGAIN

15—**No. 20 Bryant Chucking Grinders** with standard equipment. Used only a few months. Absolutely the same as new. Price so low you cannot afford to overlook this bargain.

5—**Jones & Lamson** 3 x 36 flat **Turret Lathes**, geared head, latest type of either bar and chucking work.

### Machine Tools at Bargain Prices
### BRAND NEW—IN ORIGINAL CRATES

5—**No. 2-A Warner & Swasey Turret Lathes** with both bar and chucking equipment, complete set of collets, die heads, dies, etc. At reduced prices.
9—**New Duty Punch and Shears**, 24 in. throat, ¾ in. capacity—motor driven. At interesting prices.
5—**Oster Pipe Threading Machines**, capacity up to 4 in., with six complete sets of dies, motor driven. Attractively priced.

## Used Machine Tools—Absolutely the same as new

All used machines used three months or less. Only latest design tools offered.

### HORIZONTAL BORING MILLS

3—**No. 35, 3½ in. Bar Landis Horizontal Boring, Milling and Drilling Machines.**

### VERTICAL BORING MILLS

1—**42 in. Rogers 2-head Vertical Boring Mill** arranged for motor drive.
2—**42 in. Bullard New Era Vertical Turret Lathes.**
1—**36 in. Bullard New Era Vertical Turret Lathe.**
These machines equipped with standard tools, cutting lubricant attachment and motor bracket. Machines set up but never used.

### PLANERS

1—Gray 30 x 50 x 10 ft. Widened Planer.
1—Cincinnati 24 x 24 x 6 ft. Tool Room Planer.
1—Cincinnati 42 x 42 x 12 ft. 2-head Planer.

### LATHES

1—**Cataract Precision Lathes** complete with screw-cutting and other attachments, also collets.
1—30 x 60 x 16 ft. LeBlond Gap Lathe, quick change gear, sliding extension bed; weighs 19,000 lb.
5—20 x 8 American quick change gear engine Lathes.
2—LeBlond heavy duty 27 x 16 quick change gear motor driven Lathes.
1—24 x 12 Lodge & Shipley geared head Lathe.

### MILLING MACHINES

1—Van Norman No. 2 Duplex Miller.
2—No. 3 LeBlond Plain Milling Machines.
4—U. S. Hand Millers.
2—Rockford Hand Millers.
8—Burke Bench Millers.
1—Becker-Brainerd No. 2 Universal Miller.

### SHAPERS

1—24 in. Barker back geared shaper.
1—20 in. Kelley back geared shaper.
1—16 in. Barker back geared shaper.
1—16 in. Queen City back geared shaper.
1—10 in. Pratt & Whitney vertical shaper.

### MISCELLANEOUS

1—Fraser No. 1 Universal Grinder.
1—4 ft. Foolick Radial Drill—Universal.
1—6 ft. Reed-Prentice Plain Radial Drill.
1—Ferracute D-201 drawing press—weight, 40,000 lb.
2—Ferracute EG-54 Coining Press—weight, 16,000 lb.
1—Wold No. 4 Inclinable Power Press.
1—12 in. Dill Slotter.
1—Pratt & Whitney 3¼ x 14 thread miller.
2—6 in. Gleason Bevel gear generators.
1—26 in. Rhenania Gear Hobber.
1—No. 2 Nazel Power Hammer, arranged for motor drive.
1—Abrasive Surface Grinder with magnetic chuck.

This is only part of our large stock of machinery—send us your inquiries. We may have just the machine you are looking for.

***We offer only machines that we own outright. We guarantee them to be exactly as represented.***

Wire, 'Phone or Write — 'Phone Cortlandt 8164

## MOREY AND COMPANY, INC.

Formerly Machinery Merchants, Inc.

**50 Church Street, New York City**

CHICAGO SHOW ROOM

NEW YORK SHOW ROOM

# Is It Machinery?

## Drop a Line to DALE-BREWSTER

***Following is a partial list of new machines we can ship immediately:***

### ARBOR PRESSES

Atlas, all sizes.

### DRILLS

1—36-in. Snyder sliding head.
3—32-in. Cleveland sliding head.
1—30-in. Snyder sliding head.
1—28-in. Snyder sliding head.
3—28-in. Cleveland sliding head.
1—25-in. Cleveland sliding head.
1—25-in. Silver sliding head.
1—25-in. Snyder sliding head.
1—25-in. Snyder sliding head with tapping attachment.
1—23½-in. Cleveland stationary head.
8—23-in. Snyder stationary head.
5—22½-in. Cleveland stationary head.
9—21-in. Cleveland stationary head.
4—20-in. Canedy-Otto wheel and lever feed.
1—14-in. United States sensitive.
1—14-in. Royersford sensitive.
5—Detroit 1-spindle H.S.B.B.
1—Demco 1-spindle H.S.B.B. No. 32-D
2—Detroit 2-spindle H.S.B.B.
1—Demco 2-spindle H.S.B.B. No. 32-D
1—Detroit 3-spindle H.S.B.B.
1—Demco 3-spindle H.S.B.B. No. 32-D

### BENCH AND PORTABLE DRILLS

6—Burke No. 1 bench.
1—Detroit 1-spindle bench.
5—Demco No. 22 bench.
2—Demco No. 30-A bench.
6—Stecher 10-in. bench.
1—Dumore sensitive bench.
10—Dumore sensitive.
1—Dumore type C hand.
Willey Portable Electric—various sizes.

### RADIAL DRILLS

1—Western 4-ft. heavy pattern plain.
1—Western 3-ft. plain.
1—Morris 4½-ft. plain.
3—Canedy-Otto 3½-ft. plain.

### GRINDERS

1—No. 3 Modern universal.
1—No. 1 Norton universal.
1—No. 2 Norton universal.
1—No. 1 Grand Rapids universal.
1—No. 190 Wells universal.
2—No. 2 Ried Surface.
1—No. 3 Wilmarth & Norman surface.
6—B-2-T Grand Rapids dry drill.
2—C-2-T Grand Rapids dry drill.
7—C-3-T Grand Rapids wet drill.
2—D-4-T Grand Rapids wet drill.
1—JHA Wilmarth and Morman point drill.
4—Plymouth dry tool Nos. 13, 14, 16, 17.
Partridge dry tool, all sizes.
1—Milwaukee 24-in. wet tool.
2—No. 3 Cleveland profile.
1—Bodine bench, 110 volt.
1—Racine tool post, 110 volt.
47—Dumore, type A.
10—Dumore, type B.

### LATHES

1—26-in. x 12-ft. Wickes.
1—24-in. x 10-ft. Advance.
2—20-in. x 11-ft. Chard.
1—20-in. x 10-ft. Wickes.
1—20-in. x 9-ft. Chard.
5—18-in. x 9-ft. Chard.
1—18-in. x 8-ft. Advance.
1—16-in. x 9-ft. Chard.
3—16-in. x 6-ft. Cleveland toolroom.
1—16-in. x 7-ft. Chard.
1—16-in. x 8-ft. Cleveland.
1—14-in. x 6-ft. Amtew.
4—12-in. x 4-ft. 6-in. Cleveland.
2—12-in. x 5-ft. 6-in. Davis.
1—12-in. x 4-ft. 3-in. Shepard.
1—11-in. x 6-ft. Stellar.
1—11-in. x 5-ft. Hudson.
1— 6-in. x 30-in. Dalton bench.
1— 7-in. x 35-in. Sloane and Chase, No. 5½.

### SAWS

1—13-in. x 16-in. Peerless hack saw.
1— 9-in. x 9-in. Peerless hack saw.
5— 6-in. x 6-in. Peerless hack saw.
1—10-in. x 10-in. Napier band saw.

### MILLERS

1—No. 2 Cleveland plain.
6—No. 2 Cleveland universal.
2—No. 2-A Fox universal.
3—No. 2-B Fox plain.
4—No. 1-A Fox plain.
1—No. 1-B Fox plain.
2—No. 0-B Fox plain.
1—No. 1 U. S. hand.
2—No. 3 Becker vertical.

### SHAPERS

1—20-in. Rockford used.
2—No. 3½ Rhodes.
2—7-in. Rhodes.
2—16-in. Milwaukee.
1—16-in. Walcott.
1—16-in. Ohio.
1—18-in. Osborn and Sexton.
1—20-in. Milwaukee.
1—24-in. Milwaukee.
1—24-in. Walcott.
1—24-in. Osborn and Sexton.
1—16-in. Ohio plain.
2—16-in. Ohio back geared.

### PRESSES

1—No. 4 Loshbaugh Jordan.
E. O. Partridge kick presses.
15—Atlas arbor presses Nos. 00, 0, 1, 1½, 2, 3-A, 3, 4, 4-M, 5, 24, 28.

### MISCELLANEOUS

5—Heald magnetic chucks, 110 volt, Nos. 318, 316, 68.
2—No. 3 Farwell gear hobber.
1—36-in. x 30 x 8-ft. Gorton Planer.

# DALE-BREWSTER MACHINERY CO. INC.

New York: 55 Lafayette St.

DALE-BREWSTER MACHINERY CO. INC.
Machine Tools and Supplies
NEW YORK PARIS CHICAGO

Chicago: 542 Washington Blvd.

TRADE MARK

# New MACHINE TOOLS Used
## READY TO SHIP

### *WEEKLY SPECIAL*

**84—No. ½-in. Avoy High Speed Ball Bearing Drills ⅜-in. Cap. Almost new. Price each, f.o.b. cars N. Y. C. $100.**

## AUTOMATICS

***Practically new machines—in use but a few weeks***

**6—⅜-in., ½-in. Model A, Cleveland.**
**2—⅜-in., ½-in. Model B, Cleveland.**
**22—⅝-in., ⅞-in., Model A, Cleveland.**
**19—⅞-in., Model A, Cleveland.**
**5—2-in. Model A. Cleveland.**
**3—2¼-in., 3¼-in. Model A, Cleveland**
**1—1¼-in. Gridley, Multiple Spindle.**
**1—1¾-in. Gridley, Multiple Spindle.**
**11—2¼-in. Gridley, Single Spindle.**
**10—3¼-in. Gridley, Single Spindle.**
**3—4¼-in. Gridley, Single Spindle.**

### SHAPER
1—16-in. Ohio Back Geared Crank (New)

### LATHES
1—12 x 5 Worcester.
50—No. 2 Garvin Screw Shaving.

### TURRET LATHES
32—No. 4 Warner & Swasey, Friction Back Gear.
6—No. 1 Warner & Swasey, Plain Head.
53—No. 3 Stecker Superior, Friction Back Gear.
20—No. 1 Garvin, Plain Head.
9—No. 11 Garvin, Plain Head.
9—No. 22½ Garvin, Plain Head.
6—No. 2 Biggs, Plain Head.
23—No. 3 Biggs, Friction Back Gear.
9—No. 4 Biggs, Friction Back Gear and Power Feed.

### GRINDERS
2—14 x 36 Bridgeport Cylindrical.
1—No. 2 Reid Surface (new).
5—Gisholt Tool.

### DRILLS
10—Allen High Speed, ⅝-in. Cap., Floor.
3—Leland-Gifford High Speed ⅝-in. Cap., Floor.
8—Leland-Gifford High Speed, ⅜-in. Cap., Bench.
15—Leland-Gifford Double Spindle, High Speed, ⅜-in. Cap., Bench.
84—No. ½ Avey High Speed.
139—Sigourney High Speed, ⅜-in. Cap.
37—No. 1 Langlier.
120—Pilton.

### MILLING MACHINES
1—No. 2 Kempsmith, Plain.
26—No. 0 Burke Hand, Bench Type.
26—No. 3 Burke Hand, Pedestal Type.
7—No. 0 Carter-Hakes Hand, Bench Type.
18—Wisconsin Hand.
30—Toledo.

### TAPPING MACHINES
6—No. IX Garvin, ½-in. Cap.
1—No. 2X Garvin, ⅞-in. Cap.

### MISCELLANEOUS
1—No. 25 William & White Bulldozer, 20-in. stroke.
1—No. 3 Toledo Electric Butt Welder, 1-in. Cap.

***Direct Factory Representatives of Manufacturers of Machine Tools and Heat-Treating Equipment***

## BARBOUR, LOVE & WOODWARD, Inc.
SINGER BUILDING
NEW YORK CITY

Phone: Cortlandt 133

***Successors to CARPENTER & WOODWARD, Inc.***



# SECOND-HAND MACHINERY
## FOR SALE BY
## NILES-BEMENT-POND COMPANY, 111 Broadway, New York

**Located at Our Various Factories and Stores**

### LATHES
12 in. x 5 ft. Robbins, draw-in. attach.
14 in. x 6 ft. Bradford, c.r.
14 in. x 6 ft. Whitcomb, taper, pan
14 in. x 6 ft. LeBlond, geared head
14 in. x 8 ft. Whitcomb, Q.C.
15 in. x 7 ft. P. & W. speed lathe
16 in. x 6 ft. Whitcomb Q.C.
16 in. x 6 ft. Reed, r. & f. rest
16 in. x 8 ft. Bradford, c.r.
16 in. x 8 ft. Von Wyck, quick change
16 in. x 6 ft. Prentice
18 in. x 8 ft. LeBlond, quick change
18 in. x 10 ft. Flather, c.r.
21 in. x 8 ft. LeBlond, geared head, heavy duty
21 in. x 8 ft. Bradford, c.r.
21 in. x 10 ft. Bradford, c.r.
22 in. x 8 ft. Niles, c.r.
24 in. x 10 ft. Whitcomb, q.c.
24 in. x 14 ft. Pond, q.c. taper
30 in. x 14 ft. Niles, c.r.
30 in. x 16 ft. Pond, quick change

### TURRET LATHES
2 in. x 24 in. J. & L. cone head
2 in. x 24 in. Warner & Swasey, hollow hexagon
2 in. x 26 in. P. & W. turret lathe
28 in. size J. Gisholt 3½ in. spindle
24 in. size I Gisholt, 220 volt, motor drive, d.c.
28 in. Milwaukee rigid, 4¼ in. spindle
34 in. size K Gisholt, 4½ in. spindle

### SHAPERS AND PLANERS
15 in. P. & J. Universal Shaper
16 in. Stockbridge Shaper, p'd f.
14 in. x 6 ft. Niles single traveling head Shaper
22 in. x 22 in. x 8 ft. Cincinnati,
24 in. x 24 in. x 6 ft. Heavy Cincinnati
26 in. x 26 in. x 6 ft. Pond, 2 heads
30 in. x 30 in. x 6 ft. Pond, 2 heads
30 in. x 30 in. x 8 ft. Pond, 2 heads
30 in. x 30 in. x 10 ft. Pond, 2 heads
30 in. x 30 in. x 12 ft. Pond, 2 heads, 220 v. D.C. Reversing Motor Drive
32 in. x 32 in. x 6 ft. Gray, 2 heads
42 in. x 42 in. x 26 ft. Pond, 4 heads, 220 v. D.C. Reversing Motor Drive
48 in. x 48 in. x 16 ft. Pond, 3 heads
72 in. x 60 in. x 10 ft. Pond, 2 heads
72 in. x 72 in. x 24 ft. Pond, heavy forge, 3 heads

### MILLERS AND GEAR CUTTERS
No. 1½ Cincinnati Plain, cone type
No. 2 Becker B. Plain
No. 2 Cincinnati Plain, cone type
No. 3 Brown & Sharpe universal, old style
No. 2 LeBlond Plain, single pulley
No. 5 Becker B. Vertical
No. 2 Brown & Sharpe Vertical
No. 5 Brown & Sharpe Vertical, old style
No. 3 36 in. x 8 in. Brown & Sharpe Gear Cutter
No. 4 36 in. x 9 in. Brown & Sharpe Gear Cutter
No. 6 60 in. x 15 in. Brown & Sharpe Gear Cutter
15 in. Gleason Bevel Gear Generator
24 in. Gleason Bevel Gear planer

### DRILLING MACHINES
No. 1 Putnam Gooseneck
26 in. B. F. Barnes, Sliding Head
32 in. Aurora Sliding Head
60 in. Niles, heavy vertical
3 ft. Grant Radial Drill and Boring Machine
4 ft. Prentice Speed Box Radial
4 ft. Niles Semi-universal, old style
5 ft. Niles, Semi-universal, old style
6 ft. Niles, Semi-universal, old style
6 ft. Pond, Heavy, Plain Radial, 220 v. motor drive, d.c.
2 Spindle Allen, 12 in. O.H.
3 Spindle Allen, 12 in. O.H.

### GRINDERS
No. 2 Brown & Sharpe Surface
No. 3 Rivett Internal
No. 11 Brown&Sharpe Internal
No. 3 Brown & Sharpe Cutter and Reamer
4 in. x 30 in. No. 11 Brown & Sharpe pl.
10 in. x 30 in. Landis Universal
8 in. x 48 in. No. 14 Plain Landis
12 in. x 44 in. No. 14 Plain Modern
12 in. x 66 in. No. 4 Landis Universal
39 in. Grindstone Frame Brown & Sharpe

### BORING MACHINES
No. 1 Barnes Horizontal Drill
No. 1 Bement Horizontal, 2½ in. spindle, 5 ft. tbl.
No. 2 Bement Horizontal, 3½ in. spindle, 6 ft. tbl.
No. 3 Bement Horizontal, 4½ in. spindle, 9 ft. tbl.
30 in. Niles Turret Borer
42 in. Niles Boring and Turning Mill

### MISCELLANEOUS
Air Compressor, type 10, Ingersoll-Rand, steam driven, capacity 535 ft.
Air Compressor, Ingersoll-Rand Duplex, motor driven, with 35 h.p., d.c. motor, capacity 215 ft.
Blower, No. 10 Sturtevant
Blower, No. 70 Buffalo
Blue Print Machine., Wagenhorst, 60 in., vert. cyl.
Engine, 164 h.p. McEwen, direct connected to 100 k.w. generator, d.c., 220 v.
Engine, 200 h.p. Brown, belted to 200 k.w., Westinghouse generator, d.c., 220 v.
Profiler, No. 3 Automatic, Keller
Saw, 8 in. rounds, Higley
Slotter, 6 in. Bement

# Where ACCURACY is paramount you will want these

# Scales

**They were used in the Du Pont military plants where accurate weighing was of utmost importance, they are now offered for sale**

***READY FOR IMMEDIATE DELIVERY***

**AT EXTREMELY REASONABLE PRICES**

## HOWE SCALES

**CAPACITIES FROM 16 TO 200,000 LBS.**

Stationary, Portable, Platform, Beam, Dormant, Track, Trolley, Tank, Counter, Wall, Wagon, Automatic, Minor and other types.

## FAIRBANKS SCALES

2 of 800 lbs. capacity; 1 of 1500 lbs.; 1 of 2500 lbs.; 1 portable of 2000 lbs.; 1 dormant of 2500 lbs.; 1 coal Larry of 6000 lbs.; 1 warehouse 5000 lbs.; 1 air beam 6 ft. 10 in. long.

## MISCELLANEOUS SCALES

1 Champion Wagon Scale, 10,000 lbs.; 5 Standard Coal Larry Scales, 10,000 lbs., each; 1 Toledo Computing, 20 lbs.; 1 Jones Portable, 350 kilo.; 2 American Kron Dial, 300 lbs.; 1 Toledo Automatic, 100 lbs.; 1 Chatillon Spring Balance, 30 lbs.; 1 Wonder Automatic.

Here is the solution of your weighing problem. Here you can get the best in scales without delay and at a saving. An unusual condition that makes QUICK ACTION IMPERATIVE.

Assure no delay.

MAKE YOUR INQUIRY SPECIFIC. State exactly what you want.

Scales are but a small part of the equipment to be sold. The coupon contains a general classification. Check what you want, clip the coupon and mail it to the address given. If you are interested in scales ask for list No. 10.

**Every piece of equipment offered for sale is in condition to give good service. "DU PONT DEPENDABILITY" is back of this sale.**

***All equipment and quotations subject to prior sale.***

SALES DEPARTMENT

**Du Pont Chemical Company**

INCORPORATED

**Wilmington, Delaware**

**Unprecedented opportunity to get good equipment at reasonable figures in**

- Scales ☐
- Air Compressors ☐
- Blowers ☐
- Building Materials ☐
- Bunks ☐
- Cars (Industrial) ☐
- Commissary Equipment ☐
- Contractors' Equipment ☐
- Electrical Equipment ☐
- Engines ☐
- Fans ☐
- Feedwater Heaters ☐
- Hardware ☐
- Hospital Equipment ☐
- Laboratory Equipment ☐
- Lumber (used) ☐
- Machine Tools ☐
- Paper Mill Equipment ☐
- Plant Sites ☐
- Plumbing Supplies ☐
- Pumps ☐
- Sheet Metal ☐
- Tanks ☐
- Transformers ☐
- Transmission Equipment ☐
- Turbo-Generators ☐

**CHECK THIS COUPON**

**And enclose your name and address—mail to**

SALES DEPARTMENT

**Du Pont Chemical Co., Inc.**

**Wilmington, Delaware**

10

# USED MACHINE TOOLS

**We have facilities for overhauling used tools and it is our aim to offer only reliable equipment**

No. 2 Rochester table type horizontal **Boring, Drilling and Milling Machine.**
No. 1 Lucas horizontal **Boring and Milling Machine.**
No. ½—1 sp. Avey **Bench Drills** (24).
No. ½—1 sp. Avey column type **Drills** (5).
24-in. Henry & Wright **Sensitive Drill.**
30-in. Henry & Wright **Sensitive Drill.**
1 sp. "C" Henry & Wright **Cabinet Base Drill.**
37-in. Gould & Eberhardt **Sliding Head Drills,** BG, PF, tapping att., and compound table.
No. D1 Colburn heavy duty **Drills** (9).
5-ft. Dreses plain **Radial Drill,** cone drive, BG, tapping att.
10 x 36 Norton **Plain Grinders** (3).
10 x 50 Norton **Grinder,** arranged for motor drive.
No. 2 Morse plain **Grinder.**
No. 70 Heald internal **Grinder.**
No. 34 Van Norman internal **Grinders,** with water att. (2).
Garrigus rotary surface grinders (16).
No. 4 Brown & Sharpe auto. spur **Gear Cutter.**
No. 2 Whiton auto. **Gear Cutter.**
9 x 12 Porter **Cable Lathe,** taper and facing att.
16 x 6 Hendey geared head **Lathe,** CR, PCF, SR, hollow spindle, single pulley drive.
26 x 12 Putnam Pacific type **Lathe,** CR, DBG.
No. 4 Lapointe **Broaching Machines** (2).
No. 14 Garvin **Die Slotter,** with table and micrometer.
No. 1½ Cincinnati **Plain Millers** (4).
No. 2 Cincinnati **Vertical Miller,** cone drive.
No. 14A Garvin **Plain Millers** (7).
No. 14 Garvin **Plain Miller** (4).
No. 15 Garvin **Plain Miller.**
42 x 30 x 10 Powell **Planer,** 2 heads, T. & L c/s.
4¼-in. Cleveland **Auto. Screw Machines** (2).
2-in. Cleveland **Auto. Screw Machines** (6).

## HENRY PRENTISS & COMPANY

INCORPORATED
**149 Broadway, New York**
BOSTON BUFFALO **Warehouse: JERSEY CITY** SYRACUSE ROCHESTER

# "GOOD" USED EQUIPMENT

***This List Covers a Few Items. Our Stock Is Large.***

**American 14-in. x 6-ft. Engine Lathe, SBG, Taper and D I Att.**
**Norton No. 1 Universal Cutter and Reamer Grinder, Prac. New.**
**Allen Six-Spindle HS BB Sensitive Drill.**
**Brown & Sharpe No. 14 Plain Cylindrical Grinder, 7 in. x 48 in.**
**Cincinnati 18-in. Back Geared Plain Milling Machine.**
**Bickford 5 ft. Full Universal Radial Drill.**

**SCREW MACHINES**

Bardons & Oliver No. 0 Hand.
Foster No. 2 Hand, Fric. Hd.
Costello Hand, WF, AC.
Acme 1¼ in. x 8 in. Auto., large equip.

**LATHES**

Monarch 16 in. x 12 ft. QCG., reg. equip.
Perkins 22 in. x 16 ft., CR, PCF.
Fay & Scott 16 in.-36 in. x 8 ft., Gap.
Lodge & Shipley 14 in. x 5 ft., QCG.

**MILLING MACHINES**

Rockford No. 3 Hand, Vert. Att.
Garvin No. 11 Plain, equal to new.
Garvin No. 13 Plain, A-1 condition.
Garvin No. 15 Plain, B.G.

**MISCELLANEOUS**

Western 8-spindle Drill, Adj.
Cochrane-Bly No. 4-B Metal Saw Mch.
Whitcomb 24 in. x 24 in. x 8 ft. Planer, 2nd belt drive.
Beaudry 150 lb. Power Hammer.

## LYND-FARQUHAR COMPANY

MACHINE TOOLS OF QUALITY
**Boston, Mass.**

# We Sell the Product

## of More Than

## Fifty American Manufacturers

## So, If It's a

# MACHINE TOOL

## You Want, We've Got It.

*New and Used Equipment*

## HILL, CLARKE & COMPANY, Inc.

*The Machinery Merchants*

**156 Oliver St., Boston, Mass.** **136 Cedar St., New York City**



## Partial Equipment of the Lincoln Motor Co., Manufacturers of the Liberty Airplane Motors Offered at Pre-War Prices.

### GRINDERS

*4—No. 6 Bryant Internal.
6—No. 18 Bryant Internal.
10—No. 1½ Cincinnati Cutter and Tool.
12—No. 60 Heald Cylinder.
*7—Garrigus Rotary, 10-in. Magnetic Chuck.
3—12 x 24 Modern
6—10 x 50 Norton.
*3—14 x 72 Norton.
*2—16 x 72 Norton.
*8—No. 205 Rivett Hand Oscillating.

### LATHES

6—8-in. x 60-in. LO-Swing.
4—No. 15 Garvin Plain.
4—9 x 12 Sundstrand
4—16 x 10 Rahn & Larmon.
10—21 in. x 10 ft. South Bend.
4—24 x 10 Lodge & Shipley.

### MILLING MACHINES

Type "A" Briggs.
12—No. 6 Whitney Hand.
6—8-in. Pratt & Whitney Auto.
4—10-in. Pratt & Whitney Auto.

### MISCELLANEOUS

12—2¼ x 26 in. Acme Flat Turret Lathes.
12—3¼ x 36 Acme Flat Turret Lathes.
*3—Gridley Piston Ring Machines, Plain with full equipment.
*2—Gridley Piston Ring Machines, Eccentric with full equipment.
*2—No. 1½ Potter & Johnston Piston Ring Machines, Plain with full equipment.
*2—No. 1½ Potter & Johnston Piston Ring Machines, Eccentric with full equipment.
*2—⅜-in. x ½-in. Cleveland Automatics.
*1—1-in. x 7-in. Acme Plain Chucking Machine.

* Items Marked With Star Are Not Located At Above Plant But Are In Excellent Condition Having Been Used Only a Few Months

## THE MOTCH & MERRYWEATHER MACHINERY CO.

707-715 LAKESIDE AVENUE, N. W. CLEVELAND, OHIO

DETROIT CINCINNATI PITTSBURGH

ESTABLISHED 1876

# FRANK TOOMEY Inc.

ESTABLISHED 1876

127 - 131 · N · THIRD ST · PHILADELPHIA · PA ·

### LATHES

2—13 in. x 4 ft. South Bend
13 in. x 5 ft. 6 in. new Carroll-Jamieson
13 in. x 7 ft. 6 in. new Carroll-Jamieson
14 in. x 5 ft. Lodge & Shipley, Q.C., pan bed, taper attachment
14 in. x 6 ft. Monarch, D.B.G., quick change
14 in. x 6 ft. new Carroll-Jamieson, quick change
15 in. x 6 ft. new Sidney, D.B.G., quick change, swing 17 in.
16 in. x 6 ft. new Canedy-Otto
16 in. x 10 ft. new Carroll, D.B.G., quick change
16 in. x 24 ft. new Rahn-Larmon, double back geared, quick change
17 in. x 8 ft. new Sidney, D.B.G., quick change, swing 19 in.
17 in. x 10 ft. new Sidney, D.B.G., quick change, swing 19 in.
17 in. x 8 ft. National, quick change
18 in. x 8 ft. new Canedy-Otto
19 in. x 8 ft. LeBlond, D.B.G., quick change
19 in. x 8 ft. new Sidney, D.B.G., quick change, swing 21 in.
21 in. x 8 ft. LeBlond heavy duty, D.B.G., quick change
21 in. x 10 ft. LeBlond heavy duty, D.B.G., quick change
25 in. x 14 ft. new Sidney, D.B.G., quick change, swing 27 in.
26 in. x 10 ft. Bridgeford, D.B.G., quick change
24 in. x 48 in. x 16 ft. new Rahn-Larmon Extension Bed Gap

### PRESSES

No. 3 Bliss double crank
P-2 Ferracute
No. 138 Max Ams Inclinable
No. 130 new Max Ams Inclinable
No. 64 new Consolidated
No. 65 new Consolidated

### CAR WHEEL LATHES

42 in. Niles open type, motor driven
42 in. Pond center driven, motor driven

### VERTICAL BORING MILLS

60 in. Bullard, two heads, arranged for motor drive
60 in. Niles, two heads, belt drive
42 in. Putnam car wheel boring machine

### HORIZONTAL BORING MILLS

3 in. Bar Barnes

### PLANERS

48 in. x 48 in. x 12 ft. Hamilton, four heads-motor drive
40 in. x 40 in. x 10 ft. Powell, two heads
36 in. x 36 in. x 8 ft. Gray, two heads
26 in. x 26 in. x 8 ft. Pond, one head
18 in. x 18 in. x 3 ft. Wheeler, one head

### SHAPERS

7 in. new Rhodes
14 in. Smith & Mills
16 in. new Steptoe, back geared
20 in. new Steptoe, back geared
20 in. Gould & Eberhardt, back geared
24 in. new Steptoe, back geared

### MILLERS

No. 4 Brown & Sharpe, plain
No. 3-A Garvin, Universal
No. 3 Becker, vertical
No. 1½ American, plain with dividing heads
No. 0 new Steptoe, hand

### GRINDERS

No. 1 Fraser, universal, new
No. 1 Landis, internal
No. 1 Grand Rapids, new, cutter and reamer

### RADIAL DRILLS

6 ft. Western, universal, motor drive
60 in. Bickford Plain, gear box type
48 in. Fosdick, Plain, gear box type
42 in. Canedy-Otto Post type

### DRILL PRESSES

20 in. Barnes, all geared
20 in. new Champion, back geared, power feed
20 in. new Superior, back geared, power feed
24 in. new Superior, back geared, power feed
25 in. new Superior, sliding head
28 in. new Superior, sliding head
32 in. new Superior, sliding head
36 in. new Superior, sliding head
36 in. Bement Goose Neck

### HAMMERS

400 lb. single frame steam
100 lb. new Little Giant
50 lb. new Little Giant
25 lb. new Little Giant

### PUNCHES AND SHEARS

18 in. throat double end Punch
No. 000 Hilles & Jones single end Punch and Shear
No. 52 Beloit Punch and Shear
No. 4 Beloit Splitting Shear
No. 7-B new Doty Shear

### MISCELLANEOUS

1 in. Acme Bolt Cutter
36 in. Gould & Eberhardt Gear Cutter
30 Ton W. & S. Hydraulic Press

### TURRET LATHES

No. 5 B. & O. back geared, friction head
2 in. x 24 in. Jones & Lamson, geared head
No. 1 Bardons & Oliver, wire feed
No. 52 new National Acme Automatic

**WRITE TOOMEY FIRST**

# Government Surplus Property for Sale

## By Bridgeport District Salvage Board

*Ordnance Department, U. S. Army*

By sealed bid and individual negotiation covering

## Buildings, Building and Power Equipment, Miscellaneous Machinery, Machine Tools, Factory Supplies and Miscellaneous Materials

As listed in bulletins which are issued weekly.

***Send name for bulletin describing available property for sale.***

All requests for bulletins should be addressed to

**C. J. FITCH, DRAWER "H," DISTRICT SALVAGE BOARD, ORDNANCE DEPARTMENT,**

**945 Main Street, Bridgeport, Connecticut.**

# REBUILT GUARANTEED MACHINERY

## FOR IMMEDIATE SHIPMENT

### AIR COMPRESSORS AND TANKS

1—3½ x 6-in. vertical air-cooled Air Compressor.
1—18-in. x 60-in. 100-lb. Air Receiver.

### AUTOMATICS

1—1¼-in. Cleveland Automatic Turret Screw Machine.
1—1¼-in. x 17-in. Hartford Automatic Screw Machine.

### BLOWERS

1—No. 3 American Positive Pressure Blower.
1—40-in. Edwards and Johnson Steel Plate Exhauster
3—No. 17-B Connersville Positive Pressure Blowers.
3—No. 20-B Connersville Positive Pressure Blowers.
1—No. 35-B Connersville Positive Pressure Blowers.
1—No. 5 National Steel Plate Exhauster.

### FORGES AND FURNACES

2—No. 021) Buffalo Forges.

### DRILLS

2—No. 2 Detroit 5-sp. Hor. Drillers.
1—14 in. Groton Sensitive Floor Drill, ½ in. cap.
1—14 in. Rockford Sensitive Floor Drill, ½ in. cap.
1—No. 2 Quint Standard Pattern, 4-Spindle Turret Drill
1—24 in. W. F. & John Barnes Sty. Hd. b.g., l.f. Drill Press

### GRINDERS

1—No .1, 10 x 20 Landis Universal Grinder.
1—Gorton Double-Spindle Disc Grinder.
1—No. 6 Besly Double-Spindle Disc Grinder
1—No. 3 24-in. Diamond Wet Tool Grinder.
1—No. 7 Ransom Floor Grinder, 24-in. wheels.
1—No. 6 Bennett & O'Connell Buffing Stand.
1—72-in. Holmes Auto. Knife Grinder.
1—16-in. Whitney Scraper Knife Grinder.
1—Duntley Electric Center Grinder, 110-volt, D.C.
1—No. 1 La Salle Surface and Tool Grinder
1—Sterling Universal Tool and Reamer Grinder with complete univ. equipment. 95% new
1—Cleveland Profile Grinder with motor for AC or DC, used 30 days
1—Van Dorn Electric Tool Post Grinder for 220 volts, DC.

### LATHES

1—11 in. x 4 ft. Seneca Falls Speed Lathe
1—14 in. x 8 ft. American 5 st. c., 1 c.g., s.b.g. Engine Lathe
1—16 in. x 7 ft. l.c.g., 4-st. c., s.b.g., Engine Lathe
1—14 in. x 6 ft. Lathe & Morse l.c.g., 4-st. c., s.b.g. Engine Lathe
1—24 in. Davis Turret Head Boring and Forming Lathe, 2 in. capacity
1—20 in. x 10 ft Putnam, 4-st. c., l.c.g., s.b.g. Engine Lathe

### MILLERS

1—No. 10 Kempsmith Hand Miller.
1—Chicago Hand Miller.
1—No. 1 Fox Hand and Power Feed Miller, 95% new

### MOTORS

1—20 H.P. Howell Motor for 3 phase, 60 cycle, 220 volts, 1800 r.p.m.
2—20 HP. Howell Motors for 3 phase, 60 cycle, 220 440 volts, 1200 r.p.m.
1—25 H.P. Howell Motor for 3 phase, 60 cycle, 220 volts, 1800 r.p.m.
1—25 H.P. Howell Motor for 3 phase, 60 cycle, 220/440 volts, 1800 r.p.m.
All of the above motors are 98% new.
1—1/10 H.P. Robbins & Myers D.C. Compound wound Motor, 110 volts, 1500 r.p.m.

### PIPE MACHINE

1—No. 00, 4-in. Armstrong Hand and Power Pipe Machine.

### PUMPS

1—5 x 2½ x 6 Whittaker Duplex St. Pump.
1—3 x 3 x 3 Tank Pump.
1—4½ in. stroke, 3 plunger belt driven vertical Hydraulic Pump, has 1 in. pistons, ¢, and l. pulleys, 2000 lb. pressure per square inch

### PLANERS

1—24 x 20-in. x 5-ft. New Haven Planer, 1 hd.
1—24 x 24-in. x 16-ft. Fitchburg Planer, 1 hd.
1—30 x 30 x 8 Steptoe-McFarlan Planer.

### PUNCHES AND SHEARS

1—No. 4-B, ½-in. capacity New Doty Hand Power Splitting Shear.
1—Style "M" Badger Rapid Action Punch, with shear blades, 6-in. throat.
1—No 2 Niagara Hand Power Circle Shear, for 22 gauge
1—No. F New Doty Alligator Shear, 9 in. throat, cap. 1½ in. in 1 in.

### PRESS

1—15-ton Lucas b.d. Hydraulic Press.

### TINSMITH'S TOOLS

1—2 x 36-in. Niagara Slip Roll Former.
1—Crimping Machine, 1½ rolls, 24 gage.
1—No. 546 Pexton Turning Machine, 24 gage
1—30 x 2½-in. Forming Machine.
1—20-in. Niagara Groover, 24 gage.
1—No. 10 Niagara Beading Machine, 20 gage.
1—No. 5 Pexto Lock Seam Tube Former.
1—48-in. Combination Brake and Folder.
1—21-in. Niagara Keystone Adjustable Bar Folder for No. 22 gage.
1—No. A-3, 41-in. Pexto Sheet—Iron Folder for No. 24 gauge.

### RIVETER

1—No. 103-A Grant 3/16 in. cap. motor driven rivet Spinner, 110-volt, D.C.

### MISCELLANEOUS

1—Model 162 Bristol Pyrometer.
1—Model "D" Willey Bench Drill, 110-volt, D.C.
1—13-volt Suburban Dynamo, 25-amp.
1—30 x 72-in. Buffalo Purifier.
1—100-gal. Advance-Wetmore Steam Heated Glue Heater.
1—22 x 69-in. Allis-Chalmers Closed pattern Feed Water Heater
1—100-lb. Drop Hammer, with CS.
1—No. 2 Whitton Automatic Gear Cutter, cap. for 36 x 9½-in. gears.
1—No. 3, ¼ to 5/-in. Whitton Single Spindle Centering Machine, with CS.

**BADGER-PACKARD MACHINERY CO., 133-39 West Water St., Milwaukee, Wis.**

# "BAIRD—DETROIT"

### LATHES

2—16 in. x 6 ft. Bradford Tool Room Lathes.
1—18 in. x 8 ft. Bradford Q. C., D. B. G.
1—25 in. x 12 ft. Sidney Heavy Duty, D. B. G.
1—17 in. x 8 ft. Sidney Lathe.
1—15 in. x 6 ft. Sidney Lathe.
1—16 in. x 6 ft. Rockford Tool Room Lathe.
2—14 in. x 6 ft. Carroll-Jamieson, Q. C., D. B. G.
1—No. 4 Stark Precision Bench Lathe.

### GRINDERS

1—No. 2 LaSalle Automatic Surface.
1—No. 1 Fraser Universal Grinder.
1—No. 2 Wilmarth & Morman Surface.
1—No. 3 Wilmarth & Morman Surface.
3—No. 1 Wilmarth & Morman Universal Tool Grinders.

### MILLING MACHINES

1—No. 3 Cincinnati, Vertical Miller.
1—No. 2 Rockford Heavy Duty, Universal.
1—No. 2 Rockford High Powered, Single Pulley Drive, Universal.
1—No. 1½ Rockford Plain Miller.
2—No. 1 U. S. Hand Millers.
1—No. 1 Standard Hand Miller.
1—No. 2 Rockford, Heavy Duty, Plain.

### BORING MILLS

1—42 in. Bullard Vertical.
1—30 in. Bullard Vertical.
1—30 in. Gisholt Vertical.
1—No. 1 Lambert Horizontal.
1—3A Universal.

### SHAPERS AND PLANERS

2—28 in. Queen City Crank Shapers.
1—16 in. Queen City Crank Shaper.
1—16 in. Hollingworth Crank Shaper.
1—24 in. Hollingworth Crank Shaper.
1—20 in. Milwaukee Crank Shaper.
2—24 in. Milwaukee Crank Shapers.
3—20 in. Columbia Crank Shapers.
1— 7 in. Rhodes Combination Horizontal Vertical Crank Shaper.
1—22 in. x 22 in. x 5 ft. Wheeler, Planer, 1 Head.
1—36 in. x 36 in. x 12 ft. American Planer, 1 Head.
1—48 in. x 48 in. x 14 ft. Pond Planer, 2 Heads.
1—60 in. x 60 in. x 12 ft. Pond Planer, 3 Heads.

### DRILL PRESSES

4—20 in. Silver, Plain Wheel and Lever Feed.
2—25 in. Silver, Sliding Head, B. G. Power Feed.
1—25 in. Silver, Sliding Head, B. G. Power Feed with tapping attachment.
1—No. 32 Demco 3-Spindle, High Speed Ball Bearing.
4—14 in. Francis-Reed Sensitive.
1—36 in. Wisconsin High Speed Ball Bearing Radical with tapping attachment.
1—20 in. Wisconsin, Sliding Head, Power Feed, B. G.

### MISCELLANEOUS

1—8 in. x 8 in. Nagel Air Compressor, Steam Driven.
1—8 in. x 8 in. Gardner Horizontal Air Compressor.
1—No. 8 Nutter and Barnes Cold Cut Saw.
1—600 lb. Board Drop Hammer.
1—2000 lb. Toledo Board Drop Hammer.
1—1¼ in. Model "A" Cleveland Automatic Machines.
1—2000 lb. Williams & White Board Drop Hammer.

### WOOD CUTTING MACHINERY

54 in. "Standard Perfected" Band Resaw.
54 in. Twin Band Resaw.
Complete Filling Room Equipment.
Sash, Door and Blind Relisher and Mortiser.
Window Frame Machines.
Pocket Cutting Machine.
Planer, 30 in. Sec. Roll and Chipbreaker.
Chain Mortiser No. 1.
Tenoner, Single Heads, copes and cut-off.
Combination Rip and Cut-off Saw Table.
Veneer Press 54 in. x 18 in.
Molder, 10 in.
Sender, flexible arm.

*Honest Prices*

MACHINERY & TOOLS
W. J. BAIRD MACHINERY CO.
DETROIT, MICH.

*Good Service*

265 Jefferson Ave., East

Cadillac 6520

# A FEW CHOICE OFFERINGS *FOR IMMEDIATE DELIVERY*

**LATHES and GEAR CUTTERS**

6—Sebastian Type Gap Lathes, 15 x 22 in. x 6 ft., new.
15—South Bend, 16 x 6 Lathes, like new.
2—New Yoke Head, 15 x 6 Lathes, with quick change gear, pan bed.
3—Willard Lathes, 13 x 6, pan bed, D.B.G.
Newark Gear Cutter, No. 2A, 24 x 8.
Brainard 24-in. Automatic, spur and bevel.

**DRILLS AND GRINDERS**

2—Hamilton, 28-in. sliding head Drills, tapping attachment.
6—New Excelsior Drills, 14-in. sensitive.
6—New 20-in. Back Geared Drills.
Walker Surface Grinder, with magnetic chuck.
Cincinnati No. 1 Universal Cutter & Tool Grinder.
No. 2 Morse Plain Grinder, table 12 x 36.
2—3-spindle Allen H.S. drills with oil pumps.
1—6-spindle Henry Wright drill.

**MILLERS**

1—No. 1 Brown & Sharpe Universal Miller, old style.
1—No. 14A Garvin Plain Miller, like new.
Oesterlein Universal Miller, 7½ x 18 x 24.
No. 2 Cincinnati Plain Miller.
No. 4 Brown & Sharpe Universal Miller and vertical attachment.
3—No. 3 Burke Bench Hand Millers.
No. 5 Brainard Miller, 60-in. table, motor drive.
8—No. 3½ Fox Millers.
6—No. 25 Becker back geared.

**SHAPERS**

20-in. Cincinnati back-geared Shaper.
21-in. American crank Shaper.
30-in. Cincinnati triple-geared Shaper.
16-in. Gould & Eberhardt back geared Shaper.
2—24-in. Gould & Eberhardt back geared Shapers.
20-in. Gould & Eberhardt Shaper, old style.
24-in. Queen City back geared Shaper.

**MISCELLANEOUS**

**1—New Haven Planer, 24 x 24 x 5 ft.**
**500-lb. Drop Hammer, Automatic Lift.**
**1—⅞-in. Cleveland Automatic, 4-hole turret.**
**1—Brown & Sharpe No. 2 semi-automatic Screw Machine, full set of collets.**
**2—National Acme Automatic Screw Slotters.**
**1—Colburn 34-in. Vertical Turret Boring Mill, with or without motor.**
**1—Power Belt Hammer.**

**PRESSES**

2—No. 21 Bliss Inclinable.
3—No. 2 Rockford.
2—No. 105 Waterburg Farreli Foundry Presses.
2—No. 068 Bliss double action Presses.
36—Excelsior Foot Presses, NEW.
1—No. 4 Stiles back wheel Press.
12—No. 19½ and 20 Bliss Incl. Presses, like new.
3—No. 20 Bliss Inclinable Presses, b.g., like new.
8—No. 61 Bliss Red. Presses, 6-in. stroke, like new.

***We also buy single tools or entire plants. Write or Wire***

**J. GELB & COMPANY, 201 Centre Street, New York**

SECOND HAND

# MACHINES

**DRILLS**

6—Demco bench drills, NEW.
18 in. Baker Bros. stationary head, hand lever and power feed.
16 in. New Haven, upright.
2—No. 117 Moline heavy single spindle.

**GEAR CUTTERS**

18 in. Gould & Eberhardt spur gear.

**ENGINE LATHES**

14 in. x 6 ft. Smurr & Kamen.
2—21 in. x 10 ft. Le Blond crankshaft lathes, good condition.
26 in. x 14 ft. Putnam, compound rest, steady rest.
28 in. x 14 ft. Ames, compound rest, steady rest, chuck fitted.
30 in. x 10 ft. Fifield, compound rest.
32 in. x 16 ft. Fay & Scott, compound rest, turret on shears, turret tool post.
34 in. x 16 ft. Pond, compound rest.
52 in. x 14 ft. New Haven, compound rest, geared face plate.

**MILLING MACHINES**

No. 12 Brown & Sharpe hand miller.
No. 2 Kempsmith plain.

**PLANER**

36 in. x 36 in. x 12 ft. Gray, two heads.

**SHAPERS**

24 in. Walcott.
28 in. Steptoe shifting belt.

**MISCELLANEOUS**

18 in. Imperial CHUCKING LATHE.
1 in. Smith wire feed SCREW MACHINE.
3 in. x 36 in. Jones & Lamson FLAT TURRET LATHE, with bar equipment.
3 in. Stoever PIPE MACHINE.

**Marshall & Huschart Machinery Co.**
17 S. Jefferson St., Chicago, Ill.

# USED MACHINERY

## Offered for Sale at Very Low Prices

**ENGINE LATHES**

18-in. x 7-ft. Chard Semi Q.C.G. Lathes.
22-in. x 8-ft. Hamilton Semi Q.C.G. Lathes.
22-in. x 10-ft. Hamilton Semi Q.C.G. Lathes.
22-in. x 10-ft. Davis Q.C.G. Lathes.
21-in. x 8-ft. LeBlond Q.C.G. Manufacturers Type.

**TURRET LATHES**

No. 2 Warner & Swasey.
21-in.-25-in. x 8-ft. and 10-ft. LeBlond. Heavy Duty Universal Lathes.
21-in.-24-in. Gisholt Lathes.
32-in.-26-in. Libby Lathes.
24-in. Steinle Full Swing Side. Carriage Lathes.

**AIR HOISTS**

Pneumatic Air Hoists, Air Balanced Type, 4-in. and 6-in. with 4-ft. Lift.

**DRILLING MACHINERY**

Allen, Henry & Wright, Natco.
Pratt & Whitney 2 to 16 Spindles.

**GRINDERS**

B & S. Universal Grinders.
Cutter and Reamer Grinders of Standard Makes.
Nos. 1 and 2 Sellers Tool and Shaping Grinders.
Taylor & Fenn Wet Tool Grinders.

**MILLING MACHINES**

Nos. 2, 3 and 5 Plain Cincinnati Milling Machines.
No. 5 Garvin Milling Machines.
No. 2 Brown & Sharpe Milling Machines.
30-in. Niles Slab Milling Machine.
30-in. Ingersoll Slab Milling Machines.

**PRESSES**

415 Ton Hydraulic Presses.

**MILL SUPPLIES**

Line Shafting, Hangers, Steel and Cast Iron Split Pulleys and Expansion Couplings.

Cold Saws (Inserted Teeth) "Hunter & Disston" Makes, 40-in. to 48-in. diameter.

***Address all inquiries to***

**Westinghouse Electric & Mfg. Company**
Machine Tool Sales Dept.
Garrison Alley and Fayette St., Pittsburgh, Pa.
Bell 'Phone Grant 5664

**A FEW SPECIALS**

1—No. 1 Cleveland **Horizontal Mill**, 2½ in. bar
1—Warner & Swasey **Horizontal Mill**, 2 in. bar
1—37 in. American **Vertical Mill**, 2 heads
1—33 in. x 33 in. x 10 ft. **Knecht Planer**, 4 heads
1—36 in. x 36 in. x 24 ft. **Pond Planer**, 4 heads
1—38 in. x 20 ft. **New Haven Engine Lathe**
1—20 in. x 12 ft. Monarch L.C. **Engine Lathe**
1—26 in. x 10 ft. Prentice D.B.G. **Engine Lathe**
1—25 in. x 10 ft. LeBlond Hy Duty Q.C. **Engine Lathe**
10—21 in. x 8 ft. and 10 ft. LeBlond Hy Duty Q.C. **Lathes**
1—18 in. x 10 ft. Boye & Emmes Q.C. **Eng. Lathe**
1—2 in. Cleveland Model A **Full Automatic**
1—5 ft. Niles **Plain Radial**
1—6 ft. Pond **Plain Radial**
1—4 ft. Prentice **Plain Radial**
1—No. 60 Heald **Cylinder Grinder**

**WHEEL PRESS**

350-ton Niles **Hydraulic Press**, 72 in. capacity
38 in. x 20 ft. New Haven Standard **Engine Lathe**

*We have in stock over 200 various machine tools, including Lathes of all sizes, Drill Presses, Cylindrical, Surface and Cutter Grinders, Milling Machines, Screw Machines, etc.*

***Send us your inquiries***

**BROADWAY MACHINERY COMPANY**
536-8 Broadway, Cincinnati, Ohio

A REAL BARGAIN IN

# PLANERS

We have the following rebuilt Planers available for prompt deliveries. The Planers have been used only in our own plant, where they have received the best of care.

72-in. x 72-in. x 31-ft. Pond, 2 heads.

36-in. x 48-in x 14-ft. "American," 2 heads.

26-in. x 26-in. x 12-ft. "American," 2 heads.

**THE AMERICAN TOOL WORKS CO.**
**Cincinnati, U. S. A.**

# GRAND RAPIDS SPECIALS

6—Rockford Bench **Balancing Machines.**
1—34-in. Vertical **Boring Mill.**
1—2-in. Acme **Bolt Cutter.**
2—4½ x 5 Imperial Type 12 **Compressors.**
1—10-spindle Grand Rapids **Multiple Drill.**
1—26-in. Sibley Sliding **Head Drill.**
1—No. 2½ Avey High Sped **Drill Grinder.**
1—No. 5 **Plank Flexible Shaft.**
1—No. 4 Hardinge **Furnace.**
1—No. 19 53-in. Besley **Disc Grinder.**
1—Style B Yankee **Drill Grinder.**
1—No. 2 Bath **Universal Grinder.**
1—No. 4 Monarch **Hack Saw.**
2—100-lb. Little Giant **Power Hammers.**
1—250-lb. Little Giant **Power Hammer.**
4—24 x 8 South Bend **Lathes**, 36-in. gap.
1—No. 25 Becker **Plain Miller.**
1—No. 37-B Chicago **Small Miller.**
1—No. 1 C Fox **Plain Miller.**
1—No. 3 Heavy **Plain Miller.**
1—Arcade Portable **Molding Machine.**
2—No. 6 Pangborn **Sand Blast Outfits.**
1—No. 4 Chicago **Hand Brake.**
1—No. 278 Waugh **Circle Shears.**
1—No. 140 Toledo **Electric Welder.**

*Complete list on application*

**McMULLEN MACHINERY COMPANY**
*"Everything in Shop Equipment"*
Grand Rapids, Mich.

# Reliabuilt Machine Tools

## *IMMEDIATE SHIPMENT*

2—15 ft. Horizontal Boring Mills, Floor Type, 10 in. bar.
1—102-in. BETTS Vertical Boring Mill, two swivel heads.
1—96-in. POND Vertical Boring Mill, two swivel heads.
1—52-in. BULLARD Boring Mill, Two Swivel Heads, Gear Feed.
1—34-in. KING Boring Mill, Turret Head.
2—36-in. BULLARD New Era Type Vertical Boring Mills.
2—24-in. BULLARD New Era Type Vertical Boring Mills.
3—No. 0 GIDDINGS & LEWIS Horizontal Boring Mills.
1—42 in. NILES Vertical Boring Mill, one turret, one swivel head.
1—42 in. BEMENT Vertical Boring Mill, two swivel heads.
1—62 in. COLBURN Vertical Boring Mill, two swivel heads.
1—No. 4 CINCINNATI Plain Miller, complete.
10—No. 2 CINCINNATI Universal and Plain Millers.
1—No. 3-B OWEN Plain Miller, Vertical Attachment.
1—No. 3 CINCINNATI Universal Miller, complete.
1—7-ft. 3-in. WARREN Radial, Motor or Belt Drive.
3—6-ft. PRENTICE Radials, Single Pulley Drive.
1—6-ft. POND Radial, Motor Drive.
1—5-ft. BAUSH Radial, Cone Drive.
1—4-ft. 6-in. BICKFORD Radial, complete.
2—48-in. x 48-in. x 12-ft. HAMILTON Planers, Two Heads, Arranged for Four.
1—96-in. x 72-in. x 25-ft. SELLERS Planer, four heads, complete.
1—36 in. x 36 in. x 10 ft. CINCINNATI Planer, two heads, complete.
2—NEW 42-in. x 42-in. x 12-ft. OPENSIDE Planers, Two Heads.
9—2¼-in. GRIDLEY Four-Spindle Automatics, complete.
1—No. 5 BROWN & SHARPE Universal Grinder.
2—22-in.-46-in. x 6-ft. PUTNAM Gap Lathes, complete.
1—55-in. x 22½-ft. POND Triple Geared Lathe.
1—26-in. x 10-ft. LODGE & SHIPLEY Lathes, Late Type.
3—18-in. x 8-ft. LODGE & SHIPLEY Lathes, Late Type.
20—20-in. x 8-ft. AMERICAN High Duty Quick Change Gear Lathes.
1—40-in. x 24-ft. FIFIELD Lathe, Triple Geared.
1—No. 30—12-Spindle BAUSH Drill, complete.
2—BLANCHARD Grinders, complete.
1—6-in. x 32-in. NORTON Grinder, complete.
2—No. 60 HEALD Grinders, complete.
1—18-in. DILL Slotter, complete.
3—24-in. GOULD & EBERHARDT Shapers, complete.
1—84-in. GOULD & EBERHARDT Gear Hobber.

***We carry complete stock of Lathes, Millers, Grinders, Planers, Boring Mills, Gear Cutters, Drilling Machines, etc. Send for list.***

## SIMMONS MACHINE CO., Inc.

**Offices and Warehouse: Albany, New York**

**Branch Offices: 801 Singer Bldg., New York, N. Y.**
**358 Ellicott Sq., Buffalo, N. Y.**

# NEW YORK'S GREATEST STOCK

***A few of the many machines in stock***

## BORING MILLS

10 ft. Pond-Plainfield Vertical, two heads.
7 ft. to 10 ft. Betts Vertical, 2 heads.
Two 80 in. Niles-Bement-Pond Vertical, two heads.
80 in. Pond-Plainfield Vertical, two heads.
5 ft. Poole Vertical, single pulley, thread cutting attachment, 2 heads.
Two 42 in. Bullard Vertical, 2 heads, 1 turret, 1 plain, for motor drive.
42 in. Gisholt Vertical, 2 heads.
38 in. McCabe Vertical, 2 heads.
37 in. Niles Tool Works Vertical, 2 heads.
34 in. Rogers Vertical Turret Head, thread cutting attachment.
NEW 34 in. Rogers Vertical Turret Head.
30 in. Bullard Vertical Turret Boring Mill, jawed table thread cutting attachment.
No. 3 Betts Horizontal, 5½ in. spindle, with motor—latest type.
Niles-Bement-Pond, 4⅝ in. spindle, latest type.
No. 2 Betts Horizontal, 4½ in. spindle, with motor latest type.
Betts Horizontal, 4 in. spindle.
No. 36 Rochester Horizontal Floor Type Boring, Milling and Drilling Machine, 3½ in. spindle, with motor.
Beaman & Smith Floor Type, 3 in. spindle.

## MILLING MACHINES

No. 5 Cincinnati Plain.
NEW No. 3 Becker Standard Vertical, with rotary table.
Newton Slab, Horizontal and Vertical Spindles, 45 in. x 25 in. x 9 ft.
36 in. x 36 in. x 12 ft. Ingersoll Heavy Duty Horizontal Slab, adjustable rail. Weight 42,000 lb.
22 in. x 5 ft. Ingersoll Slab, adjustable rail, with side facing head.
No. 2 Milwaukee Plain, vertical attachment, dividing heads.
Two NEW No. 1½ American Plain.
Two No. 1½ Rockford Plain.
No. 1 Bickford Plain.

## PLANERS—SHAPERS

Hilles & Jones 14 ft. Plate Planer.
62 in. x 62 in. x 17 ft. Betts, two heads.
48 in. x 48 in. x 12 ft. Pond-Plainfield, three heads.
38 in. x 38 in. x 12 ft. Gray, three heads—very fine.
36 in. x 36 in. x 10 ft. 3 in. Niles, Heavy Duty, two heads.
32 in. x 30 in. x 10 ft. Woodward-Powell, two heads.
30 in. x 30 in. x 8 ft. Niles, two heads.
32 in. Cincinnati heavy duty, double back geared Crank Shaper.
24 in. Ohio Heavy Duty, Back Geared Crank.
20 in. Queen City Back Geared Crank, single pulley gear box drive.
18 in. x 64 in. Hendey, Traveling Head.
Two 16 in. Gould & Eberhardt Crank.

## DRILLING MACHINES

6½ ft. Baush Plain Radial.
6 ft. American Heavy Duty Plain Radial, tapping attachment, motor driven, modern.
Two 4 ft. Bickford Plain Radial, single pulley drive, gear box, tapping attachment.
Baush Horizontal 16-Spindle Multiple Drill, No. 4 Morse taper.
Baush Vertical 8-Spindle Multiple, No. 4 Morse taper.
Baush Vertical 8-Spindle Multiple, No. 3 Morse taper.
Foote-Burt 5-Spindle Rail Drill.

## NEW YORK MACHINERY EXCHANGE

50 Church Street, New York City
*Machine Shops and Warehouses, Jersey City*
220-236 Culver Ave., 63-83 Pollock Ave.

# REBUILT and GUARANTEED

## *Immediate Delivery*

***Send for Complete List Just Issued***

### LATHES

32-in. x 12-ft. Heavy Duty Pittsburgh, Q.C.G., D.B.G.
31-in. x 14-ft. Niles.
2—26-in. x 12-ft. Heavy Duty Bridgeford, Q.C.G., D.B.G.
1—26-in. x 12-ft. Heavy Duty Wickes, Q. C.G., D.B.G.
2—28-in. x 10-ft. Heavy Duty Niles, Q.C.G., D.B.G.
2—20-in. x 8-ft. 6-in. Walcott D.B.G., Q.C.G.
24-in. x 26-ft. Johnson D.B.G., Q.C.G. D.B.G., quick change gear.
23-in. x 10-ft. Davis.
22-in. x 8-ft. Hamilton (2).
21-in. x 10-ft. Fitchburg.
5—21-in. x 8-ft. LeBlond.
19-in. x 10-ft. Draper Patent Head.
19½-in. x 8-ft. 6-in. L. & Davis D.B.G., G.C.G.
6—18-in. x 6- to 8-ft. Lathes.
10—16-in. Lathes.
19—14-in. Lathes.
And many others.

### TURRET LATHES

22-in. Gisholt.
1—3 x 36-in. Jones & Lamson.
2—7 x 14-in. Potter & Johnston Semi-Automatic.
No. 2 Brown & Sharpe Hand Turret.
37-in. Chucking Lathe.
16-in. Warner & Swasey Turret Lathe.
No. 4 Warner & Swasey, wire feed and Fox attach.

### MILLING MACHINES

36-in. x 8-ft. Ingersoll Horizontal.
No. 3H LeBlond Universal, D.B.G., Q.C.G.
No. 2 Brown & Sharpe Universal.
No. 2 Cincinnati Universal.
3—No. 3 Plain Cincinnati.
No. 3 Becker Plain.
No. 2A Kempsmith.
No. 15 Garvin Vertical, Q.C.G. (1).
5 x 28 in. Brown & Sharpe plain Univ. table (2).
2—No. 15 Garvin Plain.
No. 5 Cincinnati Plain.
No. 3 Garvin Horiz. Hand Milling Machine.
No. 1 Garvin Universal.
Whitney Hand Milling Machine.

### DRILL PRESSES

5-ft. Newton Radial, Q.C.G., Duplex Tapping Spindle.
2—40-in. Barnes Horizontal Radial.
2—36-in. Bickford, Circular Base Table, motor driven.
1—36-in. Dreses Radial.
1—20-in. Baker.
1—28-in. Snyder.
Plain Drills—all sizes.
21—Drill Presses, assorted sizes.

### BOILERMAKERS' MACHINERY

43-in. Gap Perkins Punch.
8½-ft. Wood Hydraulic Riveter.
100-150-ton Hydraulic Flanging and Forming Press.
Hydraulic Jib Crane.
Large Lot of Miscellaneous Ironworker's Tools, Punches, etc.

### PUNCH PRESSES

28—Punch Presses, assorted sizes.

### BORING MILLS

34-in. Bullard Vertical.
30-in. Bullard Vert.
32-in. Newton Car Wheel.
2-spindle Newton Horizontal.

### MISCELLANEOUS

2—6-ft. Arm Universal Swinging Grinders, 1½-in. spindles.
Wells Universal Grinder.
No. 17 Besly Grinder.
Rockford Broaching Machine, 15-in. stroke.
1—6-in. Newton Cut-off Saw.

***In addition to the above I have a large assortment of Boilers, Engines, and Machine Tools and General Machinery. Let me have a list of your wants. Correspondence solicited.***

**HERMAN L. WINTERER**
941-953 N. Front St., Phila., Pa.

# Machine Tools

## *Immediately Available*

One Whitcomb-Blaisdell 26 x 8-ft. second belt drive Planer, new.

One Chandler 36 x 36 x 12-ft. high-speed Planer, two heads on the cross rail.

One Pratt & Whitney 30 x 14-ft. Planer used.

One No. 3 Kempsmith Universal Milling Machine, new.

One No. 3 Kempsmith Plain Milling Machine, new.

Two No. 4-B Becker Vertical Milling Machines, used.

One Binnse Horizontal Boring & Drilling Machine, table type, 2½-in. bar, used.

One Reed-Prentice 4-ft. speed box Radial Drill, used

One Fifield 30 x 10-ft. triple-geared Engine Lathe, used.

One Flather 42 x 48 x 14-ft. Planer with two rail heads, one side head.

One Bullard Vertical Boring & Turning Mill, 78-in. swing, two heads.

One Reed Lathe 24-in. swing, 20-ft. bed with compound rest.

**FACTORY & MILL SUPPLY CO.**
137 Oliver Street, Boston, Mass.

5—3 in. x 36 in.

## JONES & LAMSON

Flat Top Turrets, Roll Feed and Auto Chuck. Almost new.

1—18 in.

## LIBBY LATHE

complete with equipment.

3—No. 3

## OWEN UNIVERSAL MILLERS

1—30 in.

## BULLARD BORING MILL

**AMERICAN MACHINERY EXCHANGE, Inc.**
Warehouse: 217 Centre St., New York City

### ENGINE LATHES

**Screw cutting, quick change mechanism, 3-step cones, double back geared, compound rests.**
4—18-in. x 6-ft. Ryersons.
2—18-in. x 8-ft. Sidneys.
5—20-in. x 10-ft. Canada Machinery Corporation.
**With turrets on carriage without compo rests.**
2—18-in. x 6-ft. Canada Machinery Corporation.
3—20-in. x 8-ft. McDougan.
**With loose change gears, 3 step cones, double back geared and compound rests.**
3—18-in. x 8-ft. Sidneys.
6—18-in. x 8-ft. Milwaukees.
**With loose change gears, compound rests single back geared.**
1—15-in. x -ft. Williams.
1—18-in. x 6-ft. Cincinnati.
4—18-in. x -ft. Barker.
4—18-in. x 6-ft. Giddings & Lewis.
3—18-in. x 8-ft. P. P. Silk.
1—18-in. x 10-ft. McDougall.
1—21-in. x 7-ft. Bertram.
1—22-in. x 10-ft. Bradford.
**Plain Turning Lathes with plain rests. (Not screw cutting)**
10—16-in. x 6-ft. Rockford, with pan bed.
4—20-in. x 8-ft. Simplex.
**With turret on carriage but withoutplain rest**
10—18-in. x 8-ft. Milwaukee.
**All above Lathes have hollow spindles and countershafts.**

### DRILL PRESSES

9—Colburn Heavy Duty High Speed, 25-in. swin Drill Presses, No. 5 Morse Taper, single pulley drive.
1—Barr, 2-spindle, 14-in. sensitive, capacity ½ in.
1—Brown & Sharpe, 36-in Vertical Boring Mill with turret head and chuck jaws.

### GRINDERS

Wells Bros. Cutter and Reamer.
Yankee Twist Drill Grinder.
Surface Grinder Table, 19 x 5½ in., with magnetic chuck, 14 x 6 in.
No. 1 Fraser Universal Cylindrical Grinder 8-in. swing, 20-in. centers.
2—Ford-Smith Cylindrical Grinders.

### TURRET LATHES

3—Jones & Lamson, 3 x 36-in. Bar Outfit.
2—W. P. Davis, 24-in. swing, set over turret all power feeds.
1—Warner & Swasey No. 4, 16-in. swing.

### MILLING MACHINES

**Ford-Smith No.2 Plain Table, 46 x 10-in.**
**Rockford No. 1½, plain table, 38 x 9 in.**
**1—No. 6, 48-in. swing Vertical Becker, latest type improved standard Milling Machines; all power feeds, longitudinal 62 in.; transverse 20 in.; vertical 20 in.; power down feed to spindle head, 12-in. power feed to rotary.**

### HACK SAWS

Racine High Speed, 6-in. capacity.
Peerless High Speed, 6 x 6 in.

### PUNCH AND DRILL PRESSES

1—Williams straight sided, back geared, single action Punch Press, 22-in. between uprights.
1—Bausch, 8-spindle, universally adjustable sliding head, multi-spindle Drill, cap. 1 in. holes

### TESTING MACHINE

1—Tinius Olsen Tensile Testing Machine, 4-screw type.

### HAMMERS

**1—Chambersburg 6,000 lb. dbl. frame Steam Hammer, brand new.**
1—Mayer Brothers, 250-lb. Trip Hammer.
2—Board Lift Drop Hammers, 1000 lb.
2—Board Lift Drop Hammers, 2000 lb.

### PUNCHES AND SHEARS

1—Long & Alstatter Combination Shear and Beveling Machine, weight about 25,000 lb.
1—Alligator Shear for 1½ in.
1—Wiener Steel Plate "I" Beam Shear for 15-in. "I" beams.
1—Hilles & Jones Single End Punch, 8-in. throat, architectural jaw, cap. ¾ through ¾ in.
1—Hilles & Jones, 20-in. throat, sing e end punch, cap. ¾ through ¾ in.

### TRAVELING CRANE

**1—Niles Electric Traveling Crane, 46-ft. span 15-ton capacity with auxiliary hoist, 5-ton 4 motor type, 220 D. C.**

### HYDRAULIC RIVETING OUTFITS

**1—16-ft. Gap Riveter**
**1—12-ft. Gap Riveter**
**1—Crane for Hydraulic Riveters**
**1000 lb. of Stellite and Red Cut High Speed Steel.**

*Our complete Machinery Bulletin sent upon request.*

**HARRIS BROTHERS CO.**
**CHICAGO**

*Used Machinery for Sale by*

## Wire Wheel Corporation of America

**Buffalo, N. Y.**

### Turret Lathes

2—24-in. Gisholts.

3—3 x 36 Jones & Lamson

### Engine Lathes

10—20-in. x 8-in. Himoff—for rough turning.

4—20-in. x 6-in. Special High Speed—for rough turning.

3—20-in. x 8-in. Lodge & Davis.

### Boring Machine

1—2¼-in. Horizontal—W. P. Davis.

### Grinding Machine

1—6-in. x 20-in. Fitchburg plain Cylindrical.

### Grinding and Polishing Jacks

1—Emery wheel stand for tool grinding.

2—No. 11 Henry & Wright.

2—Springfield Mfg. Co.

### Punch Presses

6—No. 24 Horn Type Stoll.

1—No. 5A Stiles Bliss geared power press.

### Cutting Off Machines

5—4½-in. Hurlbert & Rogers.

### Turret Screw Machines

6—No. 6 Warner & Swasey.

2—No. 4 Warner & Swasey.

1—½-in. Garvin.

3—1½-in. Pratt & Whitney.

1—1½-in. Smurr & Kamen.

### Semi-Automatic Chucking Machines

21—6A Potter & Johnston

2—No. 24 New Britain—single head type.

## "Bath"—Cleveland

*SELECTIONS FROM STOCK*

**AUTOMATICS**

2¼ in. and 4¼ in. Model A Cleveland Automatics, in very good condition, with large equipment.

3—No. 33 New Britain automatic chucking machines, 5 stations and tapping spindle, handle work up to 2½ in. diameter in chuck jaws and 5½ in. swing outside chucks, very good.

**BAR STOCK MACHINES**

2—No. 4 Warner & Swasey Screw Machines, power feed to turret, goods.

2—No. 6 Warner & Swasey Screw Machines, power feed to turret, good.

1—2 in. P & W Screw machine, good.

1—3 in. P & W Screw machine, good.

No. 2 Bardons & Oliver Screw machine with 13 collects, double friction countershaft; good.

**BORING MILLS**

24 in. Bullard Vertical Turret Lathe, side head, fine condition.

1—30 in. Gisholt boring mill, single pulley drive, rapid traverse, 3-jaw chuck, good as new.

42 in. Niles vertical boring mill, one swivel, one turret head, 3-jaw table, fine condition.

**BULLDOZER**

No. 5 Ajax Hi-Speed Bulldozer with steel bed and cut gears; in first class condition.

**DRILLS**

20 in., 22½ in., 24 in. and 28 in. Sibley Drill Presses, new. Also two 20 in. Sibley Drill Presses, second hand.

2—Spindle 24 in. Barnes all geared drill, pump and piping, fine shape, one spindle with taping attachment.

3—Sibley & Ware Drill Presses.

1—22 in. Rockford Drill Press.

2—Large Colburn D-3 Hi-speed Drills; very good condition.

**GEAR CUTTER**

No. 3—26 in. Brown & Sharpe plain gear cutter with all parts, very good condition.

**GRINDERS**

1—Cincinnati No. 1 old style cutter grinder, complete, good shape.

2—No. 2 Woods Tool & Cutter Grinders; good as new.

Wet and Dry Yankee Drill Grinders.

18 in. Bryant Internal Grinder, late model, excellent condition.

2—No. 60 Heald Cylinder Grinders, first class.

**HAMMERS**

1—100 lb. Mayer Belt Drive, regular equipment; new.

**KEYSEATER**

No. 0 Baker Keyseater with 10 in. stroke; in good condition throughout.

**LATHES**

2—18 in. x 8 ft. Mueller Engine Lathes, quick change gear, double back geared, very good condition.

2—20 in. x 8 ft. Walcott Engine Lathes, quick change gear, countershaft, etc.

24 in. x 11 ft. Johnson compound rest Engine Lathe, in very good condition, complete with standard equipment.

**MILLING MACHINES**

1—Billings & Spencer die trimming miller (improved), first class condition.

No. 00 Brown & Sharpe plain hand miller.

No. 25 Becker plain horizontal miller, almost new.

No. 3-B heavy Brown & Sharpe hi-power; fine shape.

No. 4 Brown & Sharpe cone type with dividing heads, vertical attachment, etc., very good.

1—A B 1 Becker Hi-Power Vertical fully equipped with oil pump and countershaft.

**PLANERS**

22 in. x 22 in. x 5 ft. J. S. Wheeler Planer with one belt on each side, quick return to table, in first-class operating condition.

36 in. x 36 in. x 14 ft. Pond single head planer in good condition with table 6 in. thick, no broken T slots or pegged gears, a good rugged tool, fine condition.

**PRESSES**

No. 59 Toledo Tie Rod Frame; first class condition.

1—No. 78½ Bliss Straight Side Tie Rod Frame Press, stroke 10 in., distance bed to slide stroke down adj. up 22 in.; practically as good as new.

2—No. 77½ Bliss Straight Side Tie Rod Frame Presses, 18 in. stroke.

1—Dries & Krump Power Brake 10 ft.—1 in. long, 3/16 in. capacity, belt drive; nearly new.

**SAWS**

1—11½ in. Higley Belt Cut Off Saw, 14 in. blade; in good operating condition.

2—Metal Band Saws.

3—Peerless hi-speed 6 in. saws; new.

**SHAPER**

1—24 in. Jeungst Horizontal Crank Shaper, worm gear drive, good condition.

**MISCELLANEOUS**

1—No. 0 Ajax return Roller; very good.

Small Speed Lathe, 10 in. x 5 ft.; good.

**CYRIL J. BATH & CO.**

721 St. Clair Ave., N. E., Cleveland, Ohio

## Now's the Time To Buy—

*Only Part of Complete Stock Listed*
*Prices Especially Attractive*
*Every Machine Our Own*
*Immediate Deliveries*
*All Fully Guaranteed*

### MILLING MACHINES

2—Vertical No. 2 BROWN & SHARPE, very late types, with rotary table.
2—KEMPSMITH No. 1, 2 Plain, very latest.
1—KEMPSMITH No. 1 Universal, equal to new.
1—B. & S. No. 2 Plain, with dividing heads.
2—CINCINNATI No. 12 Automatic, plain, latest.
4—KEMPSMITH No. 32 Plain, latest.
2—GARVIN No. 21 Plain, latest.
9—WHITNEY No. 6 Hand, arbors, etc.
1—SLOAN & CHASE Bench Universal, compl.

### POWER PRESSES

4—No. 20-B BLISS, very latest, 1918 blt.
2—No. 19 BLISS, latest, hardly used.
1—No. 108 Z. & H. Double Crank, latest.
3—No. 12 TOLEDO Horning, 3½ in. stroke.
9—Nos. 0, 1, 2, 3, 4 STILES Back Wheel and geared, all 1918 built.
6—GREENARD Arbor Presses, all sizes.
8—No. 10 EXCELSIOR Foot Presses, NEW.

### LATHES

5—LE BLOND 25 in. x 10 ft. Q.C.G., latest.
2—AMERICAN 24 in. x 10 ft. Q.C.G., very late.
1—HENDEY 20 in. x 8 ft. Q.C.G., Tapered.
1—18 in. x 10 ft. NATIONAL, Q.C.G., NEW.
1—14 in. x 6 ft. MULLINER, Q.C.G., T.A., NEW.
1—18 in. x 8 ft. GREAVES-KLUSMAN, Q.C. Feed.
1—16 in. x 8 ft. HAMILTON, Q.C.G., latest.
1—16 in. x 6 ft. LODGE & SHIPLEY, Q.C.G.
1—14 in. x 5 ft. SENECA FALLS, latest.
2—RIVETT No. 3½ Precision, complete.
5—AMES Precision, collets, latest.

### TOOL GRINDERS

1—B. & S. No. 2 Universal, late type.
2—B. & S. No. 1 Universal, latest types.
1—B. & S. No. 2 Surface, magnetic chuck.
1—REID Automatic Surface, mag, cks.

### SCREW MACHINES

1—No. 56 National-Acme, 4 spindle Automatic.
15—No. 4 FOSTER, very latest types.
4—No. 3 FOSTER, latest types.
1—No. 2½ GARVIN, power feed, latest.
4—3 in. x 36 in. J. & L. Flat Turret.

### SHAPERS AND PLANERS

1—CINCINNATI 20 in. B.G. ltst. NEW.
1—SMITH & MILLS 17 in. B.G. latest.
1—OHIO 16 in. B.G. Heavy Duty.
1—16 in. SMITH & MILLS Crank, good.
1—24 in. x 24 in. x 6 ft. WOODWARD & POWELL, latest type Planer.
1—PROVIDENCE Open Side, small type.

### DRILL PRESSES

1—RADIAL—Carlton 4 ft. Plain, NEW.
30—HIGH SPEED, 1 to 6 spindles, Henry & Wright, Leland-Gifford, Avey, Allen, all very latest types and like new.
—7 spindle DWIGHT-SLATE, long table.
5—20 in. B.G. EXCELSIOR, p.f., NEW.

### MISCELLANEOUS

1—STEAM HAMMER—6 in. McDougall Potter.
1—GEAR CUTTER—Becker 18 in. Spur.
1—TAPPER—Garvin No. 2 Automatic.
2—EXTRACTORS—Troy 24 in., like new.
2—MARKING MACHINES—No. 11 D.-S.

*Send for stock list, particulars and prices*

**NOTE: We are always buying—**
**Let us hear from you.**

## A. Lamberg & Company

**241-251 CENTRE STREET**
**129-131 GRAND STREET**
**NEW YORK CITY**

*Immediate Delivery*

## Used Machinery

2½-in. Industrial Works Horizontal Boring Mill.

60-in. Bullard Boring Mill, 2 swivel heads.

42-in. Gisholt, 1 turret, 1 swivel.

76-in. Bullard Boring Mill, 2 swivel heads.

6-ft. Gang Radial Drill.

32-in. x 18-ft. Bradford Lathe.

18-in. Canadian Machinery Corp. Slotter.

No. 7 Massillon single end punch and shear.

36-in. throat, arch jaws, capacity 1¼ in. thru 1 in. (new).

No. 4 Warner & Swasey Universal Screw Machine with a.c. and w.f.

No. 4—48-in. Brown & Sharpe Gear Cutter.

**STOCKER RUMELY-WACHS CO.**
117-121 N. Jefferson Street, Chicago, Ill.

## FULLY GUARANTEED SLIGHTLY USED MACHINERY

30—No. 4 Warner & Swasey **Screw Machines** G.F.H.—with power feed to turret.
4—No. 6 Warner & Swasey **Screw Machines** G.F.H.—with power feed to turret.
2—No. 3A Warner & Swasey Hollow Hexagon **Turret Lathes** (one new).
1—42-in. Gisholt **Boring Mill.**
1—3-ft. Morris **Radial Drill** (new).
1—Carlton **Radial Drill.**
1—No. 6 Becker Vertical **Milling Machine.**
1—No. 2 Brown & Sharpe Vertical **Milling Machine.**
1—No. 1 Burke **Bench Mill.**
1—Hand **Miller.**
1—No. 0 Brown & Sharpe Plain **Milling Machine with vertical attachment.**
1—No. 3 Cincinnati **Milling Machines** (plain).
2—No. 25 Becker **Milling Machines.**
1—No. 3 Becker **Milling Machine.**
1—No. 3 LeBlond **Milling Machine.**
1—No. 3 Davis Rapid **Milling Machine.**
1—No. 5 Brown & Sharpe Vertical **Milling Machine.**
1—18 x 8-ft. **Walcott Lathe.**
1—16 x 8-ft. **Hamilton Lathe.**
1—17 x 8-ft. **Reed-Prentiss Lathe.**
1—16 x 8-ft. **Walcott Lathe.**
1—18 x 8-ft. Mueller **Engine Lathe.**
1—16 x 8-ft. **Hendey Lathe.**
2—8 x 60 **Lo-Swing Lathes.**
2—16 x 6 Rockford Single Purpose **Engine Lathes.**
1—28 x 16-ft. Bradford **Engine Lathe.**
1—24 x 24 x 6 ft. **Gray Planer.**
1—30 x 30 x 8-ft. **Pond Planer.**
1—No. 17 Williams & White double **Punch and Shear.**
1—No. 1 Barnes **Screw Press.**
1—No. 19 Bliss Cam **Drawing Press.**
1—No. 65 Bliss Cam **Drawing Press.**
1—No. 69 Bliss Cam **Drawing Press.**
1—No. 4 Rudolph & Kummel open back **Inclinable Press.**
1—No. 55 National-Acme Four Spindle **Automatic Screw Machine.**
1—No. 53 National-Acme **Screw Machines.**
1—⅞-in. Model "A" Cleveland **Automatic Screw Machine.**
1—1 ¼-in. Gridley **Automatic Screw Machine.**
1—20-in. Gould & Eberhardt **Std. Shaper.**
1—No. 3 Lees-Bradner **Thread Miller.**
1—No. 2x Garvin **Tapping Machine.**
1—D—8 Colburn **High Duty Drill.**
2—Leland Gifford **Drills.**
1—3-ft. American **Radial Drill.**
1—No. 0 Giddings & Lewis **Ball Bearing Drill.**

**M. J. WALSH MACHINERY COMPANY**
Milwaukee, Wisconsin

## IMMEDIATE DELIVERY

1—No. 7 S. S. P. **American Can Co.** Geared Power Press with 8 in. stroke.
1—No. 143 **Ferracute** Geared Power Press.
1—No. 20 **Bliss** Power Press.
2—No. 4 **Loeffler** Power Presses.

**GEORGE DENNETT**
**239 Centre St., New York City**

Five 2¼-in.
**Gridley Multiple Spindle Auto. Screw Machines**
with Threading Spindle, all equal to new.

Lot of 12-in.
**Pratt & Whitney Heavy Auto. Milling Machines**
Equal to new.

Lot of other items, New and Nearly New.

**IDEAL MACHINERY CO.**
Plainville, Conn.

1—No. 2 Plain **Kempsmith Miller**
1—No. 00 **Brown & Sharpe Miller**
4—Knight Duplex **Milling Machines**
1—Quick Change **Hendey Lincoln Type Miller**
1—No. 2 Becker **Universal Milling Machine**
6—6A Potter & Johnston **Chucking Machines**
1—No. 3—26 in. Brown & Sharpe **Gear Cutter**
1—No. 2 Brown & Sharpe **Surface Grinder**
6—Chicago Automatic **Threading Machines**
1—No. 1½ in. Chicago **Full Automatic**
1—No. 3—1¼ in. Chicago **Full Automatic**
1—No. 2—1¼ in. Chicago **Full Automatic**
1—No. 4—2 in. Chicago **Full Automatic**
1—No. 2¼ in. Plain **Slide Automatic**
Landis No. 2 **Universal Grinder**
1—Blaisdell 14 x 12 **Compressor**
5—Tons of 1 in. and 1¼ in. Cold Rolled Free Cutting **Hexagon Screw Stock**

**INDUSTRIAL MACHINERY CORP.**
147 Provost St., Jersey City, N. J.

## New Bessemer Cold Rolled Screw Stock

338 tons—2⅝ in. round, 12-12½-ft. lengths.

60 tons—2⅞ in. round, 12-12½-ft. lengths.

Also 1¼, 1⅞, 2 7-16, 2⅞, 2 15-16, 3 5-16 round screw stock.

*Can sell much less than prevailing mill prices. Write or wire for prices.*

**CALUMET IRON & METAL CO.**
**327 S. La Salle St., Chicago, Illinois**

## DETROIT STOCK

### MILLING MACHINES

1—No. 3½ Pratt & Whitney Duplex, 27 in. maximum between spindles, 48 in. table feed with quick return.
1—No. 8 Becker Duplex.
1—No. 0 Rockford Plain. Like new.
1—No. 4 Brown & Sharpe Cone Type Plain.
1—No. 3 Becker-Brainerd Vertical.
1—42 x 42 x 12 ft. Ingersoll Slab Type, 1 Horizontal and 1 Vertical Spindle with 40 HP. 220 Volt D.C. Motor.
1—36 x 36 x 8 ft. Newton Planer Type, 1 Vertical Spindle, arranged for motor drive.

### LATHES AND TURRET LATHES

1—14 x 6 American Quick Change, Taper Attachment.
1—16 x 6 South Bend with Chuck Plate. NEW.
1—16 in. Warner & Swasey Back geared, Power Feed to Turret.
1—No. 3 Smurr & Kamen, 1 5/16 in. capacity.
1—3 x 16 in. Geared Head Jones & Lamson.

### GRINDERS

1—No. 3 Wilmarth & Morman Surface.
1—No. 23 Brown & Sharpe for cylinders.
1—No. 2 Diamond Wet Tool.

### BROACHING MACHINES

1—No. 2 LaPointe. Regular and extra equipment.

### DRILL PRESSES

1—2 spindle Allen, high-speed, 7 in. over-hang.
1—5 spindle Grant Type Horizontal.
1—No. 0 Garvin, two way, Horizontal.
4—12 in. Leland & Gifford, 1 spindle, 10,000 RPM., Bench Type.
1—No. 11 Natco, 6 spindles, bored for 8, 11½ in. circle.

### SHAPERS

1—24 in. Kelly double back geared, regular equipment.

### PUNCH PRESSES

1—No. 25 Toledo, capacity ¼ in. x ¼ in.
1—No. 202-A Bliss Adjustable Bed Type, 15 in. throat. NEW.

### SHEET METAL MACHINES

1—No. 8 Pettengill Power Beading Former, 42 in. throat.
1—No. 10 Pettengill Forming Rolls, 49 in. long.

### PATTERN MAKING MACHINES

1—No. 2 Oliver Wood Trimmer.
1—16 x 6 ft. Porter Wood Lathe.

*Tell Us What You Want. What Have You For Sale?*

**E. B. STICKLEY MACHINERY CO., Goebel Bldg. Detroit, Mich.**

FOR **Big Bargains** IN
**Machine Shop and Power Plant Equipment, also Rails, Cars, Locomotives, Tanks, etc.**
Get Bulletin 265—88 pages—it's a money saver.
*Large Stock Insure Quick Shipment.*
**ZELNICKER IN ST. LOUIS**

## LATHES FOR SALE

Sebastian Engine Lathe, 14 in. 5 ft. between centers, 8 in. and 14 in. face plates, 4 speed countershaft, $300.

Blount Speed Lathe, 11 in. x 6 ft., $75.

Fairbanks Power Hack Saw, $35.

**HERMANCE MACHINE CO.**
Williamsport, Pa.

FOR SALE
1—1000-lb. E. W. Bliss Board Drop
## FORGING HAMMER
good condition.
**RICHMOND FORGINGS CORPORATION**
(Acca) Richmond, Va

## POWER PRESSES

Bliss No. 20B Inclinable Geared press, with 5-in. stroke, complete and like new.
Bliss No. 52 Straight Side Geared press 2½-in. stroke, complete and like new.
Bliss No. 19 Inclinable press, 2-in. stroke.
Bliss No. 8 Bench presses, 2-in. stroke, with dial feed.
Bliss No. 8 Bench press, 1-in. stroke.
Standard No. 1C Bench press, 1-in. stroke.
Sidney No. 2 Inclinable, 2-in. stroke, tie rod construction.
Consolidated No. 2½ Inclinable presses, some with dial feed attachment, some with automatic slide feed attachment.

## LATHES

New Haven 24-in. x 16-ft. Hollow Spindle, CR, Double 5G, Quick Change feed.
Reed Lathes, 18 in. x 7 ft., taper and oil pan.
Reed Lathes, 20 in. and 22 in. x 10 ft. oil pan, C.R. H.S.
Monarch 16-in. x 6 ft. QCG, DBG, taper etc.

## MILLERS

Cincinnati No. 3 Universal Miller, Back Grd., 3-slot tab.e with countershaft.
Becker No. 25 Plain B. G. Miller.

## TURRETS

Jones & Lamson 2-in. x 24-in. Flat Turret, Geared Sliding Head Bar, Automatic Roller feed, Die head, and 17 sets dies, 15 sets split collets, 3-in. boring bar, tool stands, tool holders, etc.

## GRINDER

Brown & Sharpe No. 16 Plain Cylindrical Grinder, capacity 11¾-in. swing, 72 in. between centers includes head and foot stocks and countershaft complete.

## NOTE

We own and have in stock 75 other machines. Let us know your requirements. We are NOT brokers.

**Aetna Machinery Corporation**
13-15 Mechanic St., Newark, N. J.

## HEALD GRINDER

No. 60 Cylinder Grinding Machine.

## LATHES

One 24 in. x 12 ft. Bradford quick change three step cone. Four 20 x 8 ft. Lodge & Shipley all geared head, single pulley drive, One 36 in. x 20 ft. New Haven quick change gears.

## TURRETS

8 Potter & Johnston, Model 6A. Fine condition. Real Bargain.

***Write, Wire or Phone***

**STANDARD MACHINE TOOL CO.**
162-164 W. Naghten St., Columbus, O.

## OUR GUARANTEE

**Money Back If Not Satisfied**

### PIPE MACHINES

1—No. 306-B Oster Pipe Machine, capacity 1¼-in. to 6-in.; arranged for motor drive.
1—Williams No. 1 Pipe Machine, capacity ⅛ to 2-in.
1—No. 38 Forbes Hand Pipe Machine, capacity 1¼ to 4-in.

### GRINDERS

1—No. 2-A Landis 16 x 32 Universal Grinder.
1—No. 2 Manhattan Surface Grinder. Brand new. Working surface of table 7½ by 36 in.; longitudinal movement 38 in.
2—Gardner No. 120 Double Disc Grinders.
1—C2T Grand Rapids Drill Grinder, capacity ¼-in. to 2½-in.
1—Each Nos. 1, 2 and 3 Woods Universal Tool and Cutter Grinders, complete. (New)

### MILLERS

2—No. 1½ American Plain Milling Machines (New).
1—2-B Rockford Universal Milling Machine (New).
2—No. 0 Bickett Vertical Profiler and Millers.
2—U. S. Hand Millers.
1—No. 2 American Plain Miller.

### LATHES AND TURRETS

2—24-in. Gisholt Lathes, chucking equipment taper attachment; modern machines.
1—24-in. x 14-ft. Thayer & Houghton Lathe.
1—Each New Sidney Heavy Duty Lathes, 15, 17, 19, 25, 27 inch swing by 6, 8, 10, 12, 14-ft. beds, standard lathes; all 3 step cone, D.B.G., Q.C.
1—Each New Sidney 14, 16, 18 inch swing by 6, 8, 10-ft. beds; standard lathes; all 3 step cone, D.B.G., Q.C.
2—14-in. x 6-ft. Flather & Co. Lathe

### DRILLS, RADIALS AND MULTIPLES

1—4-ft. Universal Radial Drill.
1—No. 30 Natco 34-spindle Multiple Drill.
1—Baush 12-spindle Multiple Drill, equipped for 24 spindles; weight 30,000 lb.; capacity ½-in. to 1¼-in.
2—24-in.—28-in. Hoefer S.H., B.G., P.F. Drills.
1—22-in. Barnes Sliding Head, B.G., P.F. Drill.

### MISCELLANEOUS

1—26-in. x 24-in. x 8-ft. David W. Pond Planer.
1—6-A Toledo Butt Welder.
1—No. 3 Long & Alstatter Welder.
1—No. 2 Royersford Double End Punch and Shear; 7½-in. throat; capacity to punch ⅞-in. through ⅝-in.
1—No. 7 Long & Alstatter Punch and Shear ⅝ x ⅜ capacity 4-in. throat.
1—No. 11B Badger Alligator Shear; capacity 6 x ⅝-in. flat, 1⅛-in. round iron.

***Send for our 48-page catalog No. 200—includes over 1000 machines in our own warehouse under one roof.***

**WAYNE MACHINERY COMPANY**
**Fort Wayne, Indiana**
Branch Office and Warehouse:
18 West 2d Street, Dayton, Ohio

**Morris Machinery Co.**
NEW AND USED
**Machine Tools and Power Transmission**
93-105 Chestnut St., Newark, N. J.

## Practically New

2—24 in. **Bullard New Era Type** Vertical Turret Lathes.
2—8 in. x 60 in. **Lo-Swing** Lathes.
10—¾ in. Gridley Multiple Spindle **Automatics.**
1—48 in. x 19 ft., with raising blocks to swing 60 in., Pittsburgh **Triple Geared Lathe.**
8—No. 12 Cincinnati Plain **Manufacturing Millers.**
24—Type B-34 in. Briggs **High Duty Milling Machines.**
3—No. 2½ LeBlond Heavy Duty **Universal Milling Machines.**
6—No. 2 Cincinnati **Vertical Milling Machines.**
16—No. 1½-B Milwaukee **Vertical Milling Machines.**
21—No. 2½-B Milwaukee **Vertical Milling Machines.**
4—4½ in. x 12 in. Pratt & Whitney **Thread Milling Machines.**
6—No. 3 Lees-Bradner **Thread Milling Machines.**
2—No. 3-C Lees-Bradner **Thread Milling Machines.**
7—No. 4 Lees-Bradner **Thread Milling Machines.**
1—No. 6 Lees-Bradner **Thread Milling Machine.**
7—24 in. Gisholt **Turret Lathes.**
9—21 in. Gisholt **Turret Lathes.**
1—No. 3-A Warner & Swasey Universal Hollow Hexigon **Turret Lathe.**
6—No. 4 Warner & Swasey Universal **Turret Screw Machines.**

Also complete line Machine Shop Equipment. What have you for Sale?

**DAY MACHINERY COMPANY**
66 Exchange St., Buffalo, N. Y.

## Brand New Chucks

**Large Reduction from Manufacturers Prices**

3—22-in. Horton No. 50 Independent 4-jaw Chucks.
6—21-in. Horton Universal 3-jaw Chucks.
39—6-in. Reversible and Combination Almond 3-jaw Chucks.
31—7½-in. Reversible and Combination Almond 3-jaw Chucks.
5—9-in. Reversible and Combination Almond 3-jaw Chucks.

**MOREY and COMPANY, Inc.**
*Formerly Machinery Merchants, Inc.*
50 Church St., New York City

**MACHINES FOR SALE**

### SHAPERS

1—16-in. Potter & Johnson Shaper.
1—24-in. Potter & Johnson Shaper.

### MILLING MACHINE

1—No. 3 Plain Kempsmith Milling Machine.

*All as good as new.*

**JACKSON-WADELL MFG. CO.**
494 Mulberry St., Newark, N. J.

## *BARGAINS*

### LATHE

Niles Facing Lathe, triple geared, face plate drive, face plate 10 ft. dia.

### BORING MILL

72 in. Bickford Vertical Boring Mill, 2 swivel heads on cross rail.

### PUNCH PRESS

No. 78½ Bliss Geared Punch Press, weight 7,000 lbs., 18 in. throat.

### GEAR CUTTERS

48 in. x 10 in. Gould & Eberhardt Automatic Gear Cutter.
36 in. x 9 in. Gould & Eberhardt Automatic Gear Cutter.
18 in. Becker Brainard Automatic Gear Cutter.

### MILLER

No. 3 Hilles & Jones Vertical Miller, rotary table 36 in. diameter.

***The above can be inspected at the***

**BERTOLETTE MACHINE TOOL CO.**
Jersey City, N. J.

## LATHES

1—14 x 8 ft. Bradford Q. C., D.F.B.G., Power Feed Turret, pan bed.

1—30 x 14 ft. Bradford Standard.

1—20 x 10 ft. Bradford Q.C., D.B.G., 18 in. chuck.

1—48 x 20 Israel Johnson Triple Geared, with raising blocks to swing 60 in.

2—14 x 6 ft. Monarch.

## MILLING MACHINES

1—Cincinnati No. 3 Cone Driven Plain Milling Machine.

1—Cincinnati No. 3 Cone Driven Universal Milling Machine with vertical attachment.

9—No.6 Whitney Hand Millers.

## BORING MILL

1—Pond Vertical Boring Mill 8-ft. table, 11 ft. between housings.

**The E. A. Kinsey Company**
CINCINNATI INDIANAPOLIS

---

# EASTERN MACHINERY COMPANY

**Can furnish you anything you want in the way of**

# GOOD USED MACHINE TOOLS

**EASTERN MACHINERY COMPANY**
**412 East Pearl St. Cincinnati, Ohio.**

---

FOR SALE

# GEAR CUTTERS

30 in. x 7 in. Gould & Eberhardt automatic gear cutter, with rack feed.
36 in. x 9 in. Gould & Eberhardt automatic spur gear cutter, with screw feed .
42 in. x 9 in. Gould & Eberhardt automatic spur gear cutter, with screw feed.

***Above in good condition, can be seen in operation.***

**WICKES BROS.,** Saginaw, Michigan

---

**WE HAVE FOR SALE**

**A Small**
**Oliver Instrument Company**

# METAL SAW

**Bench Type—110 V. Motor Attached.**

**Machine is new.**

**TALGE MAHOGANY COMPANY**
Indianapolis, Ind.

---

### HORIZONTAL BORING MILLS

1—J. MORTON POOLE Heavy Pattern Floor Type Boring, milling and drilling machine 5 3/8 in. bar, excellent condition arranged for motor drive.
1—E. & A. BETTS Knee Type Boring Machine 3 in. bar Star feed facing head yoke support, etc.
1—BEAMAN & SMITH Boring and Facing Machine 28 in. x 16 ft. with 4 in. bar.

### SHEARS

1—No. 2 HILLES & JONES Guillotine Bar Shear capacity 2 1/2 in. round 2 in. x 1 1/4 in. flat 4 x 4 x 1/2 angles.
1—30 in. Throat QUINTARD single end geared, belt driven Cap. shear 3/4 in.

### PUNCH

1—26 in. Throat QUINTARD single end geared, belt driven cap. 1 in. through 1 in. with dies, etc.

### PLATE-EDGE PLANER

1—20 ft. HILLES & JONES No. 3 Plate Edge planer, capacity plane 1 in. plate, belt driven.

### PRESSES

1—50 ton FERRACUTE Geared Double Action Press, stroke of ram 2 1/2 in., stroke of plunger 5 in.
1—FALKENAU-SINCLAIR Power Punching and Stamping Press, style No. 5, stroke 1 1/2 in.

### LATHES

1—78 in. x 20 ft. NEW HAVEN Pattern triple geared engine Lathe, raising blocks to 102 in., compound rest 4 in., hollow spindle. Bargain.

### MISCELLANEOUS

1—2 in. NATIONAL Bolt Heading, Upsetting and Forging Machine.
3—3/8 in. to 1/2 in. CLEVELAND Automatic Turret or Screw Machines.
3—Two Spindle ALLEN High Speed Ball Bearing Drilling Machine No. B2. Excellent condition. Write for specifications and photographs.

Many others—write for list.

**A. G. Schoonmaker & Sons, Inc.**
25 Church St., New York City

---

# DETROIT STOCK

3—2 1/4-in. **Gridley Automatics**, motor driven, direct current.
1—No. 2-A **Warner & Swasey Hollow Hex.**
1—No. 17 Strong, Carlisle & Hammond **Furnace.**
1—No. 2 American Automatic **Surface Grinder.**
1—No. 13 Brown & Sharpe **Bevel Gear Cutter.**
1—24 in. x 24 in. x 6 ft. **Powell Planer.**
1—26 in. x 26 in. x 8 ft. **Gray Planer.**
1—24-in. **Davis Chucking Lathe.**
1—Reed Prentice Semi-Automatic **Lathe,** oil pan, pump, single pulley drive.
1—8 1/2 in. x 16 in. Potter & Johnson **Automatic.**
1—24 in. Aurora, S.H. **Drill Press.**
2—No. 3 1 5/8-in. capacity, Federal **Screw Machines,** with wire feeds.
1—6-ft. Automatic Screw Machine Co. **Chasing Lathe.**
1—No. 2 Cleveland Universal **Milling Machine.**
1—No. 2 1/2-in. Garvin **Screw Machine,** with wire feed.

*Write for Prices*

**C. E. FALES MACHINERY CO.**
Kerr Building, Detroit, Mich.

---

## USED MACHINE TOOLS
**FOR SALE BY**
# VONNEGUT MACHINERY CO.
**INDIANAPOLIS, IND.**

2—5-in. Bar Barrett Horizontal **Boring Mills**
1—Beaman & Smith four-spindle double end cylinder **Boring Machine.**
1—36-in. Ingersoll Vertical **Milling Machine**
1—2-A Becker Vertical **Milling Machine**
1—42 x 42 x 26-ft. J. S. Wheeler **Planer**
1—48 x 30 x 16 ft. Gray **Planer**
1—6-18 Besly **Grinder**
1—10-18-G Besly **Disc Grinder**
1—10-12-L Besly **Grinder** with Ring Wheel Chucks
1—24 x 18 ft. **Greaves-Klusman,** q.c.g., d.b.g
2—38 x 20 **New Haven** (not screw cutting)
1—21-in. Gisholt Gap **Turret Lathe**
2—24-in Gisholt Gap **Turret Lathes**
1—28-in Gisholt **Turret Lathe**
1—No. 2 Warner & Swasey
1—Gould & Eberhardt 14 in. Back Geared **Crank Shaper**
5—No. 2 Avey Column Type **Drills** with tapping attachment
1—Four-spindle Acme **Nut Tapper**
1—No. 2 Plain Cincinnati **Horizontal Miller**
1—No. 3 Cincinnati Universal **Horizontal Miller**
1—30 x 30 x 8 ft. Cincinnati **Planer**
16 in., 20 in., 24 in. Gould & Eberhardt **Shaper**

---

# TAPER PIN REAMERS

***Immediate Shipment From Stock***

**Prices on Application**

**HYDE PARK MANUFACTURING COMPANY, Hyde Park, Mass.**

---

1—New 2 Wilmarth & Morman
## SURFACE GRINDER
1—New 13 Worcester Screw Cutting
## ENGINE LATHE
with taper attachment
1—New 24 in. Barker Back Geared
## CRANK SHAPER

*These machines are absolutely new, never used, and will be sold at cost to close out an estate.*

Address:

**A. DALZELL HARRIS**
61 Clymer St., Brooklyn, N. Y.

---

## STEEL SHEETS

One pass cold rolled
New Stock Open Hearth
22 gage, 30 x 84 and 30 x 120
Price very attractive

**THE FERRO PRODUCTS CO.**
160 Broadway, New York City

---

**"Opportunity" Advertising:**

**Think**
***"SEARCHLIGHT"***
**First!**

0099

---

**List of Second-Hand Machines for Sale by ACME KNITTING MACHINE & NEEDLE CO.**
Franklin, N. H.

1—23-in. Sliding Head **Rockford Drill**, back geared, power feed.
1—22-in. stationary head **Barnes Drill**, back geared, power feed.
6—20-in. stationary head **Barnes Drill**, back geared, power feed.
1—Six-spindle Taylor & Fenn **Drill**, power and hand feed.
2—16-in. **Reed Lathes.**
2—16-in. **Flather Lathes.**
2—14-in. **Flather Lathes.**
1—No. 2 LaPointe **Broaching Machine**, old style.
1—Four-spindle **Rockford Drill**, with 3 Westinghouse motor power feed.
1—Standard **Gear Cutter**, 1-in. arbor with stand, size of bed 11 x 25 in.
1—Two-spindle Pratt & Whitney **Profiler.**
1—Cooley & Edlund **Milling Machine**, size of bed 8 x 12 in.
2—**Dalton Lathes**, with stands, but without countershafts; one provided with drawing in attachment.

# EVERY ONE GUARANTEED

## LATHES

Le Blond 21 x 36 x 16 ft. Gap Lathe (New).
Springfield 15 x 6 quick change friction head lathe.
Flather 14 x 6 quick change lathe.
Monarch 14 x 6 quick change lathe.
Fay and Scott 14 x 6 lathe.
South Bend 13 x 5 lathe.
Seneca Falls 14 x 5 lathe.
Seneca Falls 14 x 6 lathe.

## SHAPERS

Steptoe 16 in. Shaper.
Smith and Mills 32 in. B.G. Shaper.

## DRILL PRESSES

Snyder 36 in. sliding head back geared drill presses.
Fitchburg 36 in. sliding head back geared drill presses.
Barnes 26 in. sliding head back geared drill presses.
Snyder 24 in. stationary head back geared drill presses.

## MILLERS

Becker No. 6-62 Vertical Miller (New).
Kempsmith No. 3 Universal Miller (New).
Garvin No. 13 Plain Miller.
Garvin No. 15 Plain Miller.
Becker No. 25 Plain Miller.
Becker No. 32 Plain Miller.
Becker No. 7 High Speed Miller.
Becker-Brainard No. 3 Plain Miller.
Brown & Sharpe Mfg. Type Miller.
Bristol 10 x 28 Vertical Miller.
Fox No. 3½ Plain Miller.
Whitney No. 6 Hand Miller.

## GRINDERS

Norton Cylindrical Grinder, 10 x 50.
Landis Universal Grinder, 10 x 52.
Norton Cylindrical Grinder 14 x 50.
Cincinnati No. 4A Universal Grinder, 17 x 78.
Brown & Sharpe Surface Grinder.
Brown & Sharpe No. 3 Universal Cylinder Grinder.
Connecticut Universal Tool & Cutter Grinder.
Cincinnati No. 1½ Universal Tool & Cutter Grinder.
Norton No. 1 Universal Tool & Cutter Grinder.
Gardner No. 1 Disc. Grinder.
Yankee Twist Drill Grinder.
Norton Plain Cutter Grinder.

## PLANERS

48 x 48 x 16 Dietrich & Harvey Open Side Planer.
42 x 42 x 12 Pond 2-Head Planer.
30 x 30 x 8 American 1-Head Planer.

## BORING MILLS

Niles-Bement-Pond 60 in. 2-Head Taper Attachment, Single Pulley Drive, latest type Boring Mill.

## MISCELLANEOUS

Chambersburg Single Frame Drop Hammer 2000 lb.
Morton Traveling Head Slotter.
Garvin Automatic Tapping Machine, No. 1.
Grant Riveter, 3/16 in. capacity.
Blaidell 14 x 10 Vacuum Pump connected with 10 hp. Motor.
400 Assorted Sizes Parker Vises.
23,000 lb. 15/64 round cold rolled steel.
5 tons new cap and set screws in original packages.

***With but few exceptions, all of the tools listed above are 90% new. Our prices will convince you, that we have them to sell. WE BOUGHT RIGHT AND WILL SELL RIGHT. A TRIAL WILL CONVINCE YOU. Call, 'phone or write.***

## Modern Machinery Exchange

**25 Church Street, New York City**

Telephone Cortlandt 544.

---

SECOND-HAND
## MACHINE TOOLS

1—24-in. x 12-ft. Double Back Gear **Lathe** with Turret, O. P. P. & P.
The above is a Greaves-Klusman Lathe.
1—36 x 36 x 20 D. H. **Gray Planer**
1—**Grind Stone,** 36-in. x 6-n. Stone
1—**Crane Scale,** 25,000 lb. capacity.
1—6-Ton **Reading Hoist.**
1—Birdsboro **Belt Lacing Machine.**
1—**Sensitive Drill.**

**THE GREAVES-KLUSMAN TOOL CO.**
Cincinnati, Ohio

---

**PLANERS**
18-22-26-30-32-36-42-48-54-in. between housings, 1 2, 3 and 4 heads.

**VERTICAL BORING MILLS**
30, 36, 37 and 51-in.

**HORIZONTAL BORING MACHINES**
2½, 3, 4-in.: also 5-in. Barret Type

**RADIAL DRILLS**
2½, 3 and 4-ft. Plain and Universal.

**UPRIGHT AND MULTIPLE DRILLS**
12, 24, 36 and 42-in.: also 3 and 6 spindle

**LATHES**
Various sizes from 14 to 92-in. swing

**TURRETS**
2 x 24 in., 20"x 6 ft., 20 in. 28 in. 34 in.

**MILLING MACHINES**
58 x 38 x 14-ft. Ingersoll, 4 heads; 20-in. x 7 Brainard; No. 2 Lodge & Davis; No. 2 Hilles & Jones vertical.

**Also Punches and Shears, Gear Cutters, Grinders, Hammers, Presses, Cranes, Bolt and Pipe Machines**

*Advise us of all equipment you wish to purchase or sell*

**G. L. BENNETT MACHINERY CO., Inc.**
30 Church St., New York City

---

SECOND-HAND
## MACHINE TOOLS

1—22 x 22 x 5-ft. S. H. Cincinnati Planer.
1—24 x 24 x 6-ft. S. H. Gray Planer.
1—36 x 30 x 14-ft. D. H. Cincinnati Planer.
1—36 x 36 x 16-ft. S. H. Hewes & Phillips Planer.
1—36 x 36 x 20-ft. D. H. Gray Planer.
1—42 x 42 x 26-ft. D. H. Gray Planer.
1—48 x 42 x 12-ft. D. H. Cincinnati Planer.
1—2¼ Gridley Automatic M. D. single spindle.
1—13 x 6 Willard Lathe.
1—18 x 8 Rahn-Larmon Lathe.
1—22 x 10 Davis Lathe.
1—30 x 10 American Lathe.
1—24 x 12 American Lathe.
1—24 x 12-ft. G.-K. Lathe.

**THE CINCINNATI PLANER CO.**
Cincinnati, Ohio

---

## *FOR QUICK SALE*

48-in. Bullard Vertical **Boring Mill.**
42-in. N-B-P Vertical **Boring Mill.**
72-in. Pond Vertical **Boring Mill.**
80-in. N-B-P Vertical **Boring Mill.**
46-in. x 22-ft. Fifield **Engine Lathe.**
No. 22 and No. 18 Carlin **Allegator Shear.**
9-ft. 4-in. **Vending Roll,** Cap. ⅝.
**Planers,** all sizes.
Several **Milling Machines.**

Send us your inquiry.

**L. A. GREEN RAIL & MACHINERY CO.**
First Nat'l Bank Bldg., Pittsburgh, Pa.

---

## Tools for Immediate Shipment

14-in. x 6-ft. Hamilton Lathe, h.s., comp. rest.
18-in. x 8-ft. Hamilton Lathe, dbl. bk.gr. New.
1½-in. S. & K. Hand Screw Machine.
1½-in. Wood Hand Screw Machine.
1½-in. S. & K. Hand Screw Machines (2).
16, 18 and 24 Barker Shaper, crank. New.
24, 24-in. x 6-ft. Sellers Shaper.
3½-in. Canedy-Otto Radial, plain. New.
4½-ft. Plain Radial. Baush
Grand Rapids Grinder, Cutter and Reamer.
Miller No. 2 B & S, heavy, plain.
16-in. x 6-ft. Springfield Lathe, h.s., C.P.R. taper.
25-in. x 24-ft. Fifield Lathe.
20-in. x 16-ft. LeBlond Lathe, h.s., C.P.R.
2 x 24 and 3 x 36 J & L., double equipment.
22 x 22-in. x 6-ft. Gray Planer.
24 x 24-in. x 8-ft. American Planer.
26 x 26-in. x 8-ft. Niles Planer.
32 x 32-in. x 10-ft. Niles Planer.
Boring Mill, 10 ft., 2 swivel heads.
Boring Mill, 34-in. Colburn, 4-hole Turret Head.

**THE OSBORNE & SEXTON MCHY. CO.**
Columbus, Ohio

---

FOR SALE
## TURRET LATHES

1—No. 2 (1-in.) Bardon & Oliver with plain head, automatic chuck and wire feed, oil pan and oil pump. With turnstile feed to turret slide (Code Word—Hail). Located in New York City. Can be inspected. Write

FS60—American Machinist
10th Ave. at 36th St., New York City

## USED AND NEW TOOLS

*Immediate Shipment*

**BORING AND TURNING MILLS**

1—Used 30-in. Colburn Single Head Vertical Turret.
1—Used 42-in. Gisho't Vertical, 2 heads.

**DRILLS**

3—New 20-in. Silver, 2 with w. and l. feed, one with b.g., p.f.
1—New 24-in. Hoefer s.h., b.g., p.f.
1—New 28-in. Snyder s.h., b.g., p.f.
1—New 36-in. Cleveland slid. head, b.g., p.f., auto. stop.
1—New 3-ft. Meuller Plain Radial, gear box drive.
1—Used 6-ft. Bickford, plain radial, cone type.
1—Used Woodward & Rogers 3-spindle, 14-in. sensitive.

**GRINDERS**

1—New No. 1 Grand Rapids Universal Cutter and Tool.
1—Used No. 2 Diamond Open Side Surface Grinder, table 36-in. x 12-in.
1—Used No. 6 Besly Disc Grinder.

**LATHES**

1—New Dalton type B-4, 6-in. x 36-in. bench, on legs.
1—Used 10-in. x 46-in. Star, l.c.g., c.r. chuck.
1—11-in. x 4-ft. Blount Speed Lathe (new).
1—13-in. x 5-ft. South Bend, c.r., (new).
1—New 15-in. x 6-ft. South Bend, c.r., h.s.
1—New Oliver 16-in. x 7-ft. q.c.g., reg. equipment.
1—Used 21-in. x 10-ft. Lathe, l.c.g., c.r., chuck.
1—Used 26-in. x 12-ft. Draper, l.c.g., t.a.
1—Used 31-in. x 17½-ft. Pond, c.r., s.b.g., 26-in. chuck.
1—Used 14-in. x 24-in. gap, 5-ft. bed, Barnes slid. bed gap lathe.

**MISCELLANEOUS**

1—Used Williams & White 500-lb. Drop Hammer.
1—Used 4-in. Victor Pipe Machine.
1—Used No. 4 American Can Press, motor driven.
1—Used No. 0 Foster Plain Head Screw Machine.
1—Used 14-in. Steptoe Shaper.
1—Used 20-in. x 8-ft. Bridgeport Turret Lathe.

***The above list is incomplete; write us giving specifications of anything required.***

**FEDERAL MACHINERY SALES CO.**
16 No. Jefferson St., Chicago, Illinois.
216 Sycamore St., Milwaukee, Wis.

---

**BORING MILLS**

42 in. Colburn Vertical, 2 hds.
60 in. and 72 in. Bullard Vertical, 2 hds.
72 in. Niles and 72 in. Pond Vert., 2 hds.
48 in. Niles Car Wheel Boring Mill.

**PUNCHES AND SHEARS**

Reade 50 in. Thr. Sgl. End, Cap. 1¼ x 1 in.
Long-Alstatter No. 8 S.E., 3½ in. Thr.

**HAMMERS**

1500 lb. N.B.P. Sgl. Leg Steam Forg'g.
1500 lb. Chambersburg Steam Drop.
40 lb. Bradley Helve. 50 lb. Little Giant.

**LATHES—SHAPERS—PLANERS**

48 in. Niles Wheel Lathe, M.D.
38 in. x 25 ft. New Haven Lathe raised 56 in.
38 in. x 18 ft. Pond Triple Geared Lathe.
16 in., 20 in. and 32 in. Crank Shapers.
72 in. x 56 in. x 12 ft. Betts Planer, 2 hds.
36 in. x 36 in. x 12 ft. Pond Planer, 3 hds.
24 in. x 24 in. x 8 ft. Chandler Planer, 1 hd.

**RUSSELL MACHINE COMPANY, INC.**
Pittsburgh, Pa.

---

1—135 HP. Reeves vertical

## GAS ENGINE

complete with gas regulator, gas reservoir, compressor, etc., also

1—100 HP. Land

## GAS PRODUCER

**This equipment is practically new, only used about six months. Full details upon request.**

**The Acme Machine Tool Company**
Cincinnati, Ohio, U. S. A.

---

*Immediate Delivery*

ON USED

## MACHINERY

2—3 x 36 Jones & Lamson geared feed **Turret chucking machines** with 3 in. Collett chucks, latest type.

2—3 x 36 Jones & Lamson Friction feed **chucking machines** without Collett chucks, complete with friction countershafts. Little older type than geared feed machines.

1—No. 2-A Warner & Swasey **turret chucking machine** complete with oil pan, cross-feed and countershaft.

1—No. 25—24 in. **Foote-Burt Drill.**

**Darling Brothers, Limited**
120 Prince Street, Montreal, Canada

---

## BARGAINS

3—New 2¾-in. Model A Cleveland **Automatic Screw Machines.**

1—Used 60-in. **Newton Slotter,** complete with 220-volt D.C. Motor. Now operating. Fine condition.

1—Used No. 25 Williams & White **Bulldozer,** 20-in. stroke. Excellent condition.

10—Used 2¼-in. Single Spindle Gridley **Automatics.**

10—Used ⅞-in.-1¼-ft. Model A Cleveland **Automatic Screw Machines.**

**ANSON W. RICHARDS**
**Room 802, Singer Building**
**New York City, N. Y.**
Telephone: Cortlandt 1777

---

*Get your Wants*

*into the Searchlight*

---

## *IN STOCK*

***For Prompt Shipment***

**DRILLING MACHINES**

1—20 in. Hamilton Plain.
1—24 in. Hoeffer Sliding Head, Tapping Attachment.
1—No. 4 Baush 16-spindle Multiple Drill.

**GRINDERS**

1—No. 1 Brown & Sharpe Universal.
1—Hartford Surface Grinder, all automatic feeds, complete.
2—Walker Surface Grinders, complete with Magnetic Chucks.

**LATHES**

1—16 in. x 6 ft. Davis C.R.—P.C.F. complete.
1—16 in. x 8 ft. Van Wyck, C.R.—P.C.F complete.
3—18 in. x 8 ft. Greaves Klusman complete.
1—19 in. x 10 ft. LeBlond complete, Taper Attachment.
1—25 in. x 10 ft. Hamilton Quick Change, complete.
1—26 in. x 16 ft. Blaisdell complete.

**MILLING MACHINES**

1—No. 2 Kempsmith Universal Milling Machine, complete with dividing heads, swivel vise, vertical attachment, radius attachment and slotting attachment.
1—No. 1 Hendy-Norton Universal complete with Dividing Head, Swivel Vise.
1—No. 20 Oesterlein Plain Miller complete.
1—No. 1 Dow Plain Miller complete.

**POWER PRESSES**

1—No. 6 New Rockford Straight Side.

**PUNCHES**

1—No. 2 Hilles & Jones Horizontal Punch, 8 in. throat, capacity 1 in. in ⅝ in.
1—No. 36-C Cleveland Single End Punch, 38 in. throat, capacity 1 in. in ⅝ in.

**SHAPERS**

1—16 in. Ohio Back Geared.
1—20 in. Ohio Back Geared Shaper.

**GEAR CUTTERS**

1—24 in. Becker-Brainard Automatic Gear Cutter complete.

We carry a complete line of Independent and Universal Chucks.

**THE MORTON MACHINERY COMPANY**
139 N. Third Street, Philadelphia, Pa.

---

**FOR IMMEDIATE DELIVERY**

1—**Gisholt BORING MILL** 60 in., 2 heads, motor drive.
1—16-in. **Smith & Mills SHAPER.**
1—16-in. **Potter & Johnston SHAPER.**
1—73 Henderson **POWER PRESS,** open back grd
1—3 spindle **BAUSH DRILL.**
1—**Norton Tool Room GRINDER.**
1—No. 70 **HEALD GRINDER.**
1—**Norton GRINDER,** 6 x 32.
1—**Pelton SLOTTER** with rotary table.
1—20B. BLISS PRESS.
1—**Lodge & Davis LATHE,** 21 x 6-ft.
1—25 hp. D.C. **MOTOR,** 750 speed.
1—No. 2 **Foster SCREW MACHINE,** wire feed.
1—No. 4 **BARTON & OLIVER** power feed also wire feed.
No. 3 **Kempsmith Miller,** Universal.
No. 2 **Kempsmith Miller,** Universal.
No. 1½ **Hendy Miller,** Universal.
No. 21 **Bliss Power Press.**
1—No. 20B—**Bliss Power Press.**
16 x 6 **Hendey Lathe,** quick change, taper attch

**NOBLE TRUCKING CO.**
128-130 Bleecker Street, New York

---

## GOVERNMENT SALE

## 145 PRESSED STEEL TRUCKS

**for warehouses and platforms, f.o.b. Pittsburgh, Pa.**

**Sealed Bids Will Be Opened 10 A. M., Sept. 30, 1919**

at Zone Supply Office, 21st and Oregon Ave., Philadelphia. Particulars, special bid forms may be obtained at above office or Zone Supply Office, attention Surplus Property Officer, following cities: Boston, New York, Baltimore, Newport News, Atlanta, Jeffersonville, Ind., Chicago, St. Louis, New Orleans, San Antonio, Omaha, El Paso, San Francisco.

Refer to S. P. D. No. 1290 MV.

# TOTE BOXES

OF

# SHEET STEEL FOR SALE

Sizes

18 in. x 10 in. x 5 in.
24 in. x 10 in. x 5 in.
18 in. x 12 in. x 3 in.
31 in. x 12½ in. x 3¼ in.
17⅞ in. x 9½ in. x 2 in.
18 in. x 10 in. x 2⅞ in.

*Also Tote Boxes, racks and trays of White Pine. Attractive prices, especially to buyers of big lots.*

**RUSSIAN REMINGTON RIFLE CONTRACT TRUSTEES**

711 Flatiron Bldg., New York City

## Carter Machinery Sales Co.

500 Genesee Street
**BUFFALO, N. Y.**

Crescent 2744 Howard 360

***A FEW OF THE MACHINES WE HAVE TO OFFER***

1—6-ft. Triple gear AMERICAN RADIAL.
12—3¼-in. Single Spindle GRIDLEY AUTOMATICS.
4—No. 2 Foster Hand SCREW MACHINES.
4—No. 6 Whitney Hand MILLERS.
2—1500 Amp. Plating GENERATORS.
PLATING MACHINE (oblique) TUMBLING and Plating Barrels.
1—18 x 10 REED LATHE with chuck (rebuilt).
1—16-in. STEPTOE SHAPER (rebuilt).
2—⅞-in. Model A CLEVELANDS. New, in crate.
1—1¼-in. Model A CLEVELAND. New, in crate.
1—2⅝-in. Model A CLEVELAND.
2—2¼-in. Gridley AUTOMATICS, 4 spindle.
1—Bullard BRASS LATHE.
1—60-ft. span, 10 ton capacity TRAVELLING CRANE.
2—60-ft. span, 10 ton capacity Semi-GANTRY CRANES.
Some new Hacksaws and DRILL PRESSES.

*Send us list of machines you want or have for sale.*

## RATES:

1 inch—$3.00
4 inches—$2.90 an inch

*(The above rate applies to a 4-inch space, in one issue, a 2-inch space in two issues, or a 1-inch space in four issues. The larger spaces following may be used up in a similar way).*

8 inches—$2.80 an inch
15 inches— 2.70 an inch
27 inches— 2.60 an inch
50 inches 2.55 an inch

Rates for larger spaces furnished on application.

FOR SALE

Used, yet in good condition

# "ROCKWELL"

Forging, Annealing and Hardening

# OIL FURNACES

Different sizes, Chamber dimensions from 18 in. x 14 in. x 14 in. to 60 in. x 72 in. x 26 in.

Can be inspected at Bridgeport, Conn.

*For quotations and particulars write to*

**RUSSIAN REMINGTON RIFLE CONTRACT TRUSTEES**

**711 Flatiron Building New York City**
**Department F.**

WANTED

## ONE-POWER BRAKE

10 ft. x ⅛ in. capacity of the Dreis & Krumpe type.

**American Assembling Machine Co., Inc.**
Croton Falls, N. Y.

## Joseph Beal & Co.

**2 Stores**

**23-25 Purchase Street**
**453-457 Atlantic Avenue**
**Boston, Mass.**

### SPECIAL OFFER

1—Pedrick & Ayer Heavy Duty Back Geared Plain Milling Machine, size of table 10 in. x 48 in., straight arm. Price $800.

1—New Haven Planer, 40 in. x 40 in. x 12 ft., single head, box bed type, all feeds. Price $1450.

1—Pratt & Whitney Planer, 40 in. x 40 in. x 14 ft., single head, box bed type. Price $1500.

1—Sellers Planer, 36 in. x 36 in. x 12 ft., single head. Price $1200.

2—Herdey Lathes, 14 in. x 6 ft., latest type, motor driven.

3—No. 3 Kempsmith Plain Milling Machines, standard equipment, like new. Price $1250 each.

**We have a large stock of High Grade MACHINE TOOLS**
**Write for our list and prices.**

# MILLING MACHINES

**FOR SALE**

No. 2 Becker Standard Vertical.

6-in. x 14-in. Pratt & Whitney Thread Millers.

Used, yet in very good condition.

Can be inspected at Bridgeport, Conn.

For quotations and particulars write to

**RUSSIAN REMINGTON RIFLE CONTRACT TRUSTEES**

**711 Flatiron Building, New York City**

## Second-Hand Lathe Wanted

Must be in good condition. Swing 20 in. to 24 in. Distance between centers 150 in. Send full description, location and price to

**BIRD & SON, INC.**
**Dept. K, East Walpole, Mass.**

WANTED

# SURFACE GRINDER

Using cup shaped wheel, 6-in. to 8-in. diameter.

**Indicating Calipers Company**
506 East 19th Street, New York City

WE ARE IN THE MARKET FOR COMPLETE MACHINE SHOP EQUIPMENT OR INDIVIDUAL TOOLS.

## J. E. Duff Co., Inc.

**247-249 Centre Street, New York**

A second-hand

## BRAKE

in first class condition for bending plates up to ⅜ in. thickness and 10 feet long.

**RICKARD *and* SLOAN**
Evening Post Bldg., 20 Vesey St., New York

WANTED

**GRINDERS**

One 16 x 48 Crank Shaft Grinder.
One 16 x 48 Plain Grinder.
One No. 2 or No. 3 Universal Grinder.
One No. 60 Heald Grinder.

**GEAR SHAPERS**

Three No. 36 Fellows Gear Shapers.

**PLANERS**

Two 6 and 15 in. Gleason Bevel Gear Planers.

W37—American Machinist
10th Ave. at 36th St., New York City

WANTED

**TOGGLE DRAWING PRESS**

Bliss No. 5-S or similar, state age, price and where it may be seen.

CALIFORNIA METAL WORKS
47th Ave. and East 12th St.

SEARCHLIGHT SERVICE SECURES SATISFACTORY SALES

2004

**USED MACHINE TOOLS**

**WANTED**

*Must be in First-Class Condition*

LeBlond or American 24 in. x 10 ft. Heavy Duty Crank Shaft Lathes.
No. 3-B an dNo. 4-B Brown & Sharpe Heavy Duty Plain Milling Machines.
36-in. Bullard Vertical Turret Lathe, New Era type.
Norton 10 x 72 Heavy Duty Plain Grinding Machine.
Norton 16 x 50 Heavy Duty Double Head Grinding Machine for Crank Shaft Pin grinding.
No. 60 Heald Internal Cylindrical Grinding Machines.
No. 615 Fellows Spur and Spiral Gear Shaper.
3-in. x 36-in. Jones & Lamson Flat Turret Lathes.
Carwen or Norton Crank Shaft Balancing Machine.
36-in. Cincinnati Bickford Heavy Duty Upright Drill.

*In answering, give full details, stating how long used, where can be inspected and price.*

**International Fabricating Corp.,** Wilkes-Barre, Pa.

**WANTED**

**Machine Shop Equipment**

Consisting of Universal and Plain Milling Machines, Shapers, Planers, Drill Presses, etc., etc. Would be interested in purchasing complete plant for cash.

**Terminal Machine Co.,** 404 Broome St., New York City

## POSITIONS VACANT

A FOREMAN wanted for small accurate shaft grinding. Must be thoroughly experienced with previous successful record. Location Middle West, long established electrical manufacturer, act quickly. State experience definitely, and salary desired. P-4, Am. Mach., Chicago.

### Canada

THE Herbert Morris Crane & Hoist Company, Limited, Niagara Falls, Canada, is prepared to receive applications from a young, progressive engineer for a position as designer on electric hoists. Applicants should give full particulars of experience, ambition and salary requirements in first letter. Good prospects to the right man.

### Connecticut

FOREMAN wanted for department employing about 25 men, in a general hardware manufacturing concern in a Connecticut city. One having experience in general tool and machine work and used to manufacturing small parts in both small and large quantities. Reply, stating age, experience and approximate wages desired at start. P-71, Am. Mach.

### Delaware

PRACTICAL superintendent wanted in small machine shop, making specialties, located near Philadelphia. Must be good practical man with wide mechanical experience. Should understand punching and die work. State salary required and where previously employed. P-973, Am. Mach., Phila.

## POSITIONS VACANT

### Illinois

BILGRIM generator operator wanted. Give age, experience and wages wanted. P-971, Am. Mach., Chicago.

FOREMAN wanted. Experienced on gear cutters and generators. Give age and experience in reply. Salary $2500. P-970, Am. Mach., Chicago.

SEVERAL competent and resourceful draftsmen wanted with shop experience, on medium and heavy machinery, including presses and other sheet metal working machines. To men of ability and energy liberal compensation is offered, together with unusual prospects for the future and most pleasant working conditions. Address giving full particulars. P-734, Am. Mach., Chicago.

WE have an excellent position open for first-class production superintendent in Illinois, with special ability to handle and develop men, in a modern rapidly growing factory making a line similar to high grade agricultural machinery. Employing 150 men. Excellent opportunity for right man. State experience and salary expected. P-51, Am. Mach., Chicago.

### Massachusetts

REPUTABLE Massachusetts concern manufacturing interchangeable power transmission devices has desirable opening for engineer draftsman with thorough knowledge general machine shop practice, punch presses, jigs and fixtures. Technical education desirable but not necessary. Thorough, practical machinist whose experience is reinforced by study sufficient to enable him to devise ways and means and supervise them through the layout, construction and operation, and act as assistant to chief engineer—able to suprvise plant maintenance, study operations, devise new tools and fixtures and special devices. Excellent opportunity; advancement limited only by energy and results accomplished. State experience fully, salary expected. Address, P-74, Am. Mach.

## POSITIONS VACANT

SUPERINTENDENT for factory manufacturing small metal parts, employing about 300 men and women. Will have supervision of tools, dies and special automatic machinery. Salary to start, $4000. Write, stating age, experience, if at present employed, name of concern will be treated confidential; past employers and other information of interest. Employers' Association of Eastern Massachusetts, 166 Devonshire St., Boston, Mass.

### Michigan

DIE cast plant superintendent, experienced in making both aluminum and white metal die castings. Must be capable mechanic, have executive ability, and be able to get good production results. Give full particulars in first letter as to experience, age, salary, etc. This is a well-established concern and requires one who can produce. P-69, Am. Mach., Leader-News Bldg., Cleveland.

### New Hampshire

AN experienced, competent and reliable time study, rate maker and inspector wanted. Small shop. Light work. Duplication of parts. Must have had all around experience. P-42, Am. Mach.

### New York

FIRST-CLASS steam turbine designer wanted to take charge of drafting room by company making steam turbines and reduction gears. P-6, Am. Mach.

## DESIGNERS

Those having experience in any of the following lines have an opportunity to secure permanent positions:

**Special Machine Designers**
**Jig and Fixture Designers**
**Punch and Die Designers**

Call for a personal interview at the Employment Office, or apply by letter, giving detailed qualifications and age.

**WESTERN ELECTRIC CO., Inc.**
48th Ave. and 24th St., Chicago, Ill.

**WANTED**

**First-class toolmakers.**
**First-class machinists.**
**Jones & Lamson operators.**
**Milling machine operators**
**Drill press operators.**
**First-class hardener familiar with heat treating of steels and steel tubing.**
**Surface and cylindrical grinders.**
**Assemblers on automobile universal joints and shafts.**

***Apply by letter, giving previous experience and with whom you have been employed for the past five years, or apply in person to***

**SLOCUM, AVRAM & SLOCUM LABS., INC.**
120 Pacific Street, Newark, N. J.

## Experienced Draftsman Wanted

Preferably one familiar with sheet metal working machinery. Permanent work.

**Toledo Machine & Tool Company**
Toledo, Ohio

## TOOL DESIGNERS

Having had experience designing jigs, fixtures and production tools to be used for manufacturing small gas engines in large quantity—Permanent positions.

**THE DOMESTIC ENGINEERING CO.**
Dayton, Ohio

## POSITIONS VACANT

FOREMAN, punch presses, shears and brakes; shop making metal boxes. Must be good organizer and be able to handle men; unusual opportunity for right man. P-64, Am. Mach.

HIGH-GRADE machine tool salesman is wanted; able to head department of large Eastern organization handling electrical apparatus, internal combustion engines, pumps and other machinery. Good salary and interest in profits to right man. Apply, P-70, Am. Mach.

MACHINISTS wanted, steady all-year-round work for first-class bench and lathe hands on ordinary medium-size machine work. No labor troubles, factory at Lindenhurst, L. I., N. Y., 36 miles from New York City on South Shore of Long Island; fine, healthy location. To men that will prove their ability after a fair trial, the company will rent to them new brick and stucco houses with all improvements, four large rooms, bath and pantry, with a large piece of ground surounding it, at $4.50 per week, total rental including water. Reply, stating nationality, age, experience, references, and lowest wages to start. Imperial Machine & Foundry Corp., Lindenhurst, L. I., N. Y.

WE have permanent positions for two first-class planer hands, four lathe hands, ten bench hands, all around machinists and assemblers. Apply by letter to the American Assembling Machine Co., Croton Falls, New York.

**Ohio**

MECHANICAL foreman or superintendent, first-class machinist preferred with experience in manufaturing boilers and radiators to take charge of machine-shop production. Must be high-class man, capable of perfecting economical organization, reducing costs, etc. P-72, Am. Mach., Leader-News Bldg., Cleveland.

**Pennsylvania**

ENERGETIC factory representative with office in Philadelphia, to handle on a commission basis, self opening die head of exceptional merit. Exclusive territory to the right man. Write for further particulars and state qualifications. P-964, Am. Mach.

MACHINE tool salesman thoroughly experienced in every branch of the machine tool business. Must have had actual selling experience of at least five years. Position open in Philadelphia territory. P-62, Am. Mach., Phila.

TWO high grade designers wanted, one for hydraulic work, and one for general mechanical work, and heavy machinery, also two first class checkers. Write giving full details of experience, age, salary expected, and when at liberty, to H. H. Hummel, Bethlehem Steel Co., Bethlehem, Pa.

**Wisconsin**

DRAFTSMEN and designers wanted by prominent manufacturing concern located in the middle west. Men familiar with the design of electrical apparatus and with considerable mechanical experience preferred. Splendid opportunity for men released fro mthe army or navy service who have not as yet found permanent positions. In reply please cover the following information: Education, experience, age and salary expected. P-43, Am. Mach., Chicago.

WORKS manager. For a plant in the Middle West, employing about 1500 men, producing electrical equipment, steam engines and machine tools. Must be a good executive and mechanic; state full details as to experience, references and salary expected. Address, P-65, Am. Mach., Chicago.

## EMPLOYMENT AGENCIES

CLEVELAND Engineering Agency, Rose Building, Cleveland, wants quickly experienced engineers, draftsmen and technical men, available for executive, sales or engineering positions. Send stamp for blank and list of vacant positions.

GENERAL Engineering Agency, Pittsburgh, Penn., requires experienced mechanical engineers, superintendents, master mechanics, general foremen, millwrights and draftsmen for excellent Eastern, Central and Western vacancies.

**Employment Service**

NEGOTIATIONS handled by R. W. Bixby during the fiscal year recently closed, brought his clients in touch with 2284 openings. The number of openings outnumbered clients of the service more than three to one. Correspondence is invited from men qualified for positions between $2500 and $25,000 only. Negotiations strictly confidential and individual; conducted along lines of highest professional ethics. Established 1910. R. W. Bixby, 307 Lockwood Building, Buffalo, New York.

## TECHNICAL MEN

We are looking for high grade technical trained men to locate with the Middle-West Manufacturers. The following are a few of the positions we have open at present:

Production manager for manufacturer of small automatic machines, $6000 to $8000.

20—Draftsmen, mechanical, structural steel and architectural, $1800 to $3000.

Chief Draftsman experienced in small machinery parts, $3000 to $4000.

Detailers experienced in structural steel work, $2000 to $3000.

Industrial Engineer experienced in chart and layout work, $3000 to $4000.

Sales Engineer experienced in gasoline motors, pulleys, gears, conveying machinery, etc., $3000 to $3600.

Electrical Engineer experienced in manufacture of motors, dynamos, transformers, etc., $3000.

**BULLETIN ABSTRACT COMPANY**
*(Employment Experts)*
Technical Dept., St. Louis.

**MANAGERS AND EXECUTIVE ENGINEERS**
desiring to enter confidential negotiations conducted by a conservative organization can acquaint themselves with some of the unusual opportunities offered by our exclusive service.

| | |
|---|---|
| 2—Gen. Managers, auto bodies, iron & woodworking products, financial selling and production experience | $10,000-20,000 |
| 4—Works Managers | 3,000-10,000 |
| 3—Production Mgrs., large tractors, trucks, etc. | 5,000-10,000 |
| 2—Gen. Managers, Chemical mfg. and alkali | 8,000 |
| 2—Purchasing Agents, motor experience | 6,000 |
| 4—Chiefs Accts., factory, cost executives | 4,000- 6,000 |
| 2—Works Engineers | 4,000- 5,000 |

Tool Designers, Draftsmen, etc.
Many other high grade positions too numerous to mention.

**V. G. TRUEBLOOD & CO.**
*Employment Service*
Established 15 Years.
Association Building, Chicago.

## Technical Training

**Intensive Two-Year Courses**

**Industrial Mechanical Engineering**
**Industrial Electrical Engineering**
**Industrial Chemical Engineering**

Expressly designed to afford an efficient training in the shortest time consistent with thoroughness. Liberal entrance requirements. Low tuition.

**Illustrated Circular on Request**

**School of Science and Technology**
**PRATT INSTITUTE**
**BROOKLYN, N. Y.**

## POSITIONS WANTED

TOOL engineer, thoroughly experienced in the design of jigs, fixtures, cutting tools, punch and dies and gages, planing of operations and tool layouts, desires executive position. Age, 33. At present in charge of design of tools and routings. PW-18, Am. Mach., Phila.

**Connecticut**

GENERAL or works manager wishes connection with progressive company, with opportunity to develop. Age, 39. Technical graduate. Thorough shop and drafting experience. Extended training in production, planning, routing and costs. Past 10 years executive positions as superintendent, works and general manager. In charge manufacturing, production, purchasing, costs and engineering. At present also in charge of sales. Address PW-78, Am. Mach.

PRODUCTION manager having technical training and several years practical experience, open for immediate engagement. Initial salary moderate. References furnished. PW-55, Am. Mach.

SUPERINTENDENT, 20 years' practical experience in the manufacture of medium and light accurate machinery, tools and dies. American, familiar with modern shop practice, planning, routing, etc. Successful record with reputable firms. PW-10, Am. Mach.

TESTING engineer, technical graduate; 32; expert on American and European Diesel engines, wants responsible position, go anywhere; speaks English, French, Hindustan and German; wide experience in England, India and America; testing engineer on submarines; first-class reference; just discharged from the U. S. Army. PW-73, Am. Mach.

**Illinois**

ADVERTISING manager for large Chicago manufacturing company wants similar position in Western California preferred. Has thorough practical and technical knowledge of machine and tool manufacturing. $5,000. Address PW-982, Am. Mach., Chicago.

EFFICIENY engineer; practical efficiency without red tape. Practical as well as technical knowledge of machine and tool manufacturing. Prefer western location. $5,000. Address PW-13, Am. Mach., Chicago.

**Indiana**

SUPERINTENDENT or foreman, trained toolmaker and machinist with all the necessary education to fill the job. Not a college man, but can deliver the goods. PW-990, Am. Mach., Chicago.

**Iowa**

A PRACTICAL progressive man with 10 years' experience as machinist and tool maker and 16 years in executive positions from general foreman to general superintendent on work similar to adding machines, typewriters, electrical instruments, etc., open for a permanent connection Oct. 1st. Can furnish the best of references from past employers. Location Central or Eastern States. PW-25, Am. Mach., Chicago.

**Massachusetts**

ARE you satisfied with your cost figures? They should tie up with your ledger. High-grade cost man, now and past fourteen (14) years; department head of successful corporation; wishes to make new connection. Will produce results without friction and over-system. Familiar with all modern office and factory methods, cost accounting, payroll, inventories, routing, rate setting, common law, employment and welfare work. Active, good mixer, married, forty-seven (47) years old. A-1 references. Start $5000. PW-980, Am. Mach.

## POSITIONS WANTED

**Michigan**

AUTOMOTIVE and sales engineer, extensive experience in manufacture of passenger and commercial vehicles; capable of taking charge of research work, design and sales engineering for part manufacturer; university graduate; age, 32; married. PW-63, Am. Mach., Leader-News Bldg., Cleveland.

**Minnesota**

MANUFACTURING executive wants position with future. Technical education, thorough shop and drafting experience and production training. Familiar with machine tools, tractor, gas engine and airplane manufacturing. PW-985, Am. Mach., Chicago.

**New Jersey**

ENGINEER with executive experience as production engineer and chief draftsman; 16 years' experience on machine and tool construction and design, production routing, experimental work and plant layouts. American; 36; family; technical education; now employed; A-1 references. PW-14, Am. Mach.

MECHANICAL engineer, technical graduate; recently first lieutenant Ordnance Department supervising manufacture of small interchangeable parts, and thoroughly familiar with patent matters, desires position. Salary $3,000 per year. PW-68, Am. Mach.

**New York**

DESIGNER, experienced in designing special machinery and tool equipment, desires responsible position. Location, anywhere. Lowest salary considered, $2500 per year. PW-993, Am. Mach.

FARMERS lighting set engineer wants position with a concern desiring to place in the market a farmer's electric lighting set. Has had unusual experience in above line as well as in the design and production of similar apparatus. Address PW-61, Am. Mach.

FOREMAN toolmaker with 16 years' experience in the design and construction of tools, jigs, fixtures, dies, gauges, special machinery for the accurate production of fine mechanical tools and precision machinery is open for growing position with reliable concern. Am 34 years of age, married, of good habits and a hustler. Thorough mechanic, capable executive, resourceful and familiar with modern methods. Best of references. PW-15, Am. Mach.

GENERAL foreman or assistant superintendent, machine shop or production, 13 years' practical experience; age 30. Good production engineer. Desire a change. Location immaterial. Salary $65.00 weekly. Desire to locate with manufacturing concern. PW-45, Am. Mach.

POSITION wanted as superintendent; for 18 years with a large marine oil engine plant, and designer of a large marine oil engine, which has stood the severest test, and for manufacturers the most economical and simplest engine to build, desires a position where he can follow up and apply his experience. On account of war the concern has been compelled to discontinue all work on oil engines, therefore this engine is not in the market. Has patents on several improvements and complete drawings as well as first-class references. Age 46; strong, physically, and willing to work seriously and tackle any proposition, with a confidence based upon past performances. Address, PW-75, Am. Mach.

### EMPLOYERS

Send us your inquiries for men of technical training and experience. We are obtaining employment for soldiers, sailors and marines released from the service.

Re-Employment Bureau of New York City for Soldiers, Sailors and Marines, 505 Pearl Street, north of Municipal Building, Professional Section, Worth 9250.

*Mr. President:*

**My experience and ability fully meet every requirement for a**

# Responsible Plant Executive—

**My record as**

**General Manager**
**(and Treasurer)**
**Works Manager**
**General Supervisor**
**General Superintendent**

**Covers**

1½ years General Superintendent—built new plant, designed tool equipment, purchased and installed modern machinery which reduced the cost of production 100%.

4½ years General Supervisor of equipment — manufactured special machinery and equipment for the manufacture of electric lamps and supervised the installation of them in the company's several plants.

2 years Works Manager—built large addition to plant, purchased and installed necessary machinery, organized plant and successfully completed contract for military rifles.

***Age 45. Married. Looking for the position that is—or will be—big enough to NEED me. Immediate interview—anywhere.***

PW79—American Machinist
10th Ave. at 36th St., New York City

POSITION WANTED

## ERECTOR

An experienced mechanic wishes position with some company as erector in this or foreign country. Have worked on that line of work for last 12 years; can take care of all medium and heavy machinery. No matter what line of work you have I can put it up for you. I am 36 years old; speak 4 languages.

PW80—American Machinist
935 Real Estate Trust Bldg., Phila., Pa.

## POSITIONS WANTED.

SCREW machine products, man, 36, married, car designer in efficiency department of large typewriter concern, operating 180 B. & S. and 25 Acme Screw Machines, desires position as superintendent. Practical toolmaker. PW-991, Am. Mach.

TECHNICAL graduate, 30, six years on general shop work; planning and production work; time and motion study and piece rates; three years in charge of shop practice in engineering department of western college; editorial experience on large technical paper. Available about Oct. 1. PW-997, Am. Mach.

TOOL designer, executive, extensive experience on all classes of production tools and equipment desires position. PW-2, Am. Mach.

**Ohio**

ENGINEER designer, technical graduate; 15 years' experience in machine tools, special automatic machines, jigs, tool equipment for quantity produtcion of automobiles, sewing machines, adding machines, etc. At present in charge of machine tool designing; desires to make a change. Address, PW-54, Am. Mach., Leaders-News Bldg., Cleveland.

**Pennsylvania**

DESIGNING engineer on special machine tools, medium and heavy; turning and boring, planing, grinding; various types of milling, slabbong, gear cutting, automatic machinery, etc. Will consider proposition of executive position. PW-66, Am. Mach., Phila.

GENERAL foreman or assistant superintendent, practical mchanic with executive and initiative ability. Experienced in manufacturing of machine tools and general machinery design of tools; time study and organization work. Can produce maximum production. PW-67, Am. Mach., Phila.

## WANTED

**Back Issue Wanted**

A number of copies of the August 1, 1918, issue of American Machinist are needed to complete my files. For a limited time 30c. per copy will be paid. Send your copy today addressing to L. Leight, c/o McGraw-Hill Company, Inc., Tenth Avenue at 36th Street, New York City.

**New Catalogs Wanted**

On account of fire at our tractor plant, which destroyed all our catalogues, we wish that all firms interested would supply us with new catalogues. Moline Plow Tractor Branch, Rock Island, Illinois.

**Wanted to Buy for Cash**

A No. 2, No. 4 and No. 6 Roller Feed Brown and Sharp Screw Machine. State condition and price. J. MacC., 1502 S. 52nd St., Phila., Pa.

## PATENT ATTORNEYS

PATENTS. C. L. Parker, patent attorney, McGill Bldg., Washington, D. C. Inventor's handbook sent upon request.

PATENTS, trade-marks, expert service, conscientious personal replies to all inquiries. Samuel F. Cole, Patent Attorney, 1406 G Street, N. W., Wash., D. C.

**MUNN & CO.**

*Patent and Trade-Mark-Attorneys*

643 Woolworth Building NEW YORK CITY
625 F Street, WASHINGTON, D. C.
801 Tower Bldg., Chicago, Ill.

*74 years' practice.* *Handbook on request*

## BUSINESS OPPORTUNITIES

**License Will Be Granted to Manufacture**

New automobile tire on royalty; made of sheet steel. For particulars address, Wm. Gerwein, Patentee, 2020 Howard St., San Francisco.

**Oil Engines**

Full sets of shop working drawings for sale; marine or stationary; solid injection, great simplicity, Diesel economy; 96 sheets 24 by 36 reversible $1200; 50 sheets 16 by 18 horizontal $600. T. Lucas, Mt. Sinai, Long Island.

## FOR SALE

**Grinders For Sale**

1 Thompson, 1 Middlesex, 1 Fraser. All in absolutely first-class running condition, almost new. Entire change of class of work makes them unnecessary to our equipment. Lehigh Machine Co., Leighton, Pa.

**The Following Three Patents**

No. 1,105,423 engine cylinder; No. 1,124,893 punch press; No. 1,177,513 knockdown box; for sale. Will be sald outright in group, individual or on royalty basis. Can be manufactured in any machine shop. For further information apply to A. W. Gustafson, 70 Belmont Ave., Jersey City, N. J.

FOR SALE

**GOING BUSINESS**

# MACHINE TOOL SHOP

**Established in 1912**

*Located in*

**BROOKLYN, N. Y.**

Full Capacity 50-60 Men.

Shop is very well equipped with Modern Machinery and adapted for manufacturing of Small Gasoline Engines, Special Automatic Machines, Dies, Tools, etc.

BO81—American Machinist
10th Ave. at 36th St., New York City

**Machine Shops, Foundries**

Specialty Shops, etc. Sold or Exchanged on Commisions Basis. No exclusive contract asked. Partnerships arranged or capital procured for any genuine proposition. Strictly confidential.

**WESTON & CO.**
1440 Broadway, New York

WANTED

**SHOP-MANAGING PARTNER, with $5000 and GOOD LOCATION**

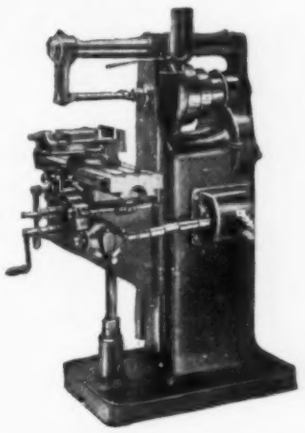
Advertiser has good shop equipment and splendid line strictly staple small tools of world-wide demand and good profit.

BO687—American Machinist
935 Real Estate Trust Bldg., Phila., Pa.

Efficiency Engineer, practical mechanical expert **would like to interest financial man or manufacturing concern with $25,000** or more for manufacturing staple metal parts. Ready market Guaranteed 150 to 200 per cent. net profit first year Full information.

**J. Bornstein**, 8112 Superior Ave., Cleveland, O.

## FOR SALE



**All rights, drawings, patterns and blueprints for the manufacture of the Metz Milling Machine illustrated above, together with one completed machine.**

The Metz Milling Machine has several distinctive features. For example, it is interchangeable from power feed to hand feed in 30 seconds. Back gears inside of column. Weight about 1400 lbs. Everything including machine, $3000.

***Will also sell rights, drawings, patterns, etc., for manufacture of Metz Surface Grinder and Metz Foot Press for $1,000.***

***Write for full particulars***

METZ MACHINE TOOL WORKS
562 W. Washington St., Chicago, Ill.

FOR SALE

Machine Tool Manufacturer is willing to dispose of

**Patterns and Drawings**

**of complete line of Power Presses, with Jigs and Special Tools for manufacturing**

Splendid line for foundry with machine shop. Established business with excellent reasons for selling.

BO861—American Machinist
657 Leader-News Bldg., Cleveland, Ohio

FIRM OF

# MERCHANTS

having large and influential connection in Great Britain

**Wishes to Negotiate**

with responsible manufacturers for the supply of Steels, Forgings, Castings, Engineers' Tools and other material for the Engineering and Allied Trades.

M1000—American Machinist
10th Ave. and 36th St., New York, N. Y.

# WE ARE PREPARED

## TO

***Appraise*** — Any kind of Manufacturing plant. Our appraisers are acknowledged to be the best in the business.

*We know our terms will suit you.*

***Finance*** — Do you need additional capital in your business? Arrangement can be made for unlimited capital on any legitimate manufacturing proposition.

*Our charges are nominal.*

***Liquidate*** — Either as a part or an entirety. Our list of people requiring complete plants have no equal. If it is your intention of retiring from business let us know it. Perhaps we have someone listed who is looking for your plant.

*Quick action—our motto.*

***Equip*** — We are prepared to equip any kind of a Manufacturing plant. We have at our disposal numerous quantities of equipment that we can set in a plant at a very attractive figure. If it is your intention to equip a plant be sure to get our figure first.

*We buy right and sell right.*

**We specialize in Metal, Iron and Woodworking Industries**

*Let us write you more about your proposition as applied to your individual case.*

***Call, phone or write.***

**INDUSTRIAL PLANTS CORPORATION, 25 Church Street, New York City**

**Cortlandt, 544**


# Selling Opportunities

## Salesmen — Agents — Representatives

### SALESMEN WANTED

**Side Line Salesmen Wanted**

to sell complete line of "Wedge" tool-bit holders. Sells at sight. Good commission. Chamberlain Machine Works, Waterloo, Iowa.

**Specialty Salesman Wanted**

A large Eastern manufacturer of electrical specialties has opening for a wide awake experienced salesman to sell illuminating specialties to industrial plants, steam and electric railways, also handling same lines through jobbers. Technical education very desirable. Give full experience and state present salary. Confidential. Address AS-965, Am. Mach., Phila.

### SALESMEN AVAILABLE

**Desires Connection With Large Firm**

Purchasing agent—the assistant purchasing agent of large automotive industry employing 5000 hands is open for engagement Oct. 1. Advertiser desires connection with large firm in the automotive industry, where his thorough knowledge of sources of supply, and sound judgment of market conditions and values will be capable of full utilization. AS-76, Am. Mach.

### AGENTS WANTED

**Shop Agents and Mechanics Wanted**

To sell Brown & Sharpe, Starrett, Goodell-Pratt and Slocomb tools, also steel and wood tool chests of the best makes. Excellent pay and unlimited opportunities. One man per shop. Send for large catalog and agency proposition today. Chas. E. Tucker & Son, York, Pa. (Known the world over as "The Tool King.")

### AGENTS AVAILABLE

**Well Known Productive Sales Organization**

With successful record for the past number of years. Acquainted with personnel of machine shops, foundries, factories, etc., will consider acting as exclusive agents for manufacturer, or inventor of merited specialty. Have sixteen hustling salesmen covering all parts of United States. Can furnish references as to financial standing. AS-202, Am. Mach.


**ENGLISHMAN**

(37) 15 years' experience commercial engineering, 5 years' practical and technical training electrical, mechanical, also steel expert, own office Westminster, London, complete selling organization, *desires first-class American Agency* for the U. K. Extensive personal connection with Manufacturers and exporters.

A853—American Machinist
6 Bouverie St., London, E. C., England.

**Sales Organization**

**WANTED**

***To handle on an exclusive agency basis***

**"LOGAN"**

**Air Operated Chucks**

We solicit applications for the following territory, which is now open: New England States, New York State, Pennsylvania, Maryland, Missouri and Canada. In reply give full particulars regarding territory covered, and lines you are now handling.

**FRANK G. PAYSON COMPANY**
9 South Clinton Street, Chicago, Ill.

**SEARCHLIGHT SERVICE SECURES SATISFACTORY SITUATIONS**

2003

# Contract Work


**Designed 33 Tools in 10 Days**

One of our customers brought in a rush job consisting of designing tools for use in an automobile plant. It was very urgent.

To accommodate him we designed 33 jigs, fixtures, etc., in 10 days.

How is that for prompt service?

**SERVICE ENGINEERING Co.**

New York 25 Church St.

Detroit, Mich. 906 Majestic Bldg.

**WRIST PINS**
IN QUANTITY PRODUCTION

Interchangeable Machine Parts

*Get Our Prices*

LINCOLN MACHINE CO.
PAWTUCKET, R. I.

**MANGANESE BRONZE CASTINGS**

COLUMBUS BRASS CO.
COLUMBUS, OHIO

**WORCESTER MACHINE SCREW COMPANY**
WORCESTER, MASS.

Exceptional equipment to handle your special parts, and a complete stock to give you satisfactory service on regular goods.

**Let Us Bid**

We are again in a position to take orders for special and contract work, etc.

With additional equipment we are now more than ever able to give our patrons the benefit of our experience.

Send blueprints today.

**Blair Tool & Machine Works, Inc.**
521 Greenwich St., New York

**Correct**

Every bit of work done by us is correctly done. Every special machine, tool, part, die, etc., must stand a rigid inspection before it is shipped.

In other words we absolutely guarantee every bit of our work. Can we be of any assistance to you?

**The Steel Products Engineering Co., Springfield, Ohio**

Accurate Screw Machine Work

**The ATLANTIC MFG. CO.**
Milford Conn

# Let Us Be Your Toolroom

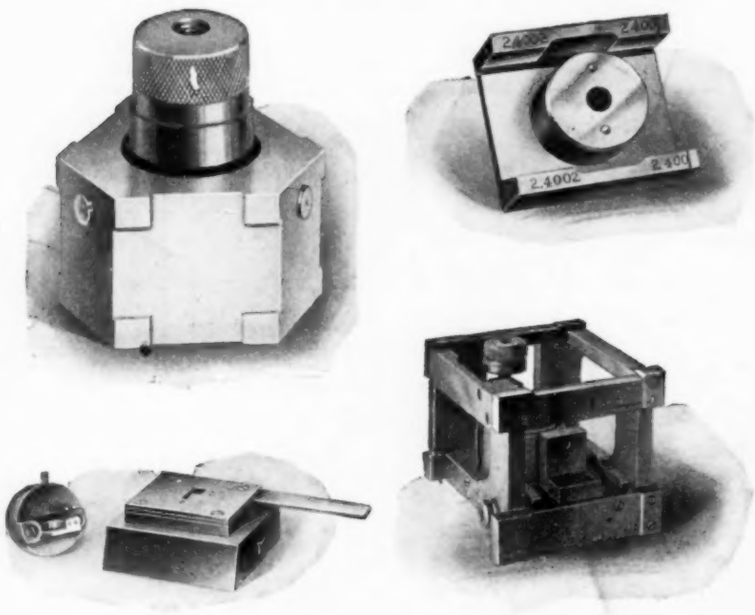
***Quality*** | ***Prompt Delivery*** | ***Price***

are three important factors which you necessarily must give consideration when placing your orders for

## Tools and Precision Machinery

If you will tell us your requirements or send us your blueprints you will save time by letting us answer these questions for you.

**Tools of Any Description**



**Precision Machinery of Any Description**

When you deal with us you have not only the services of one of the best equipped Toolrooms in United States, but also a large successful organization of men with many years' practical experience both in manufacturing as well as Tool Designing.

## ARTHUR BROCK, Jr. TOOL & MFG. WORKS

**533 North 11th Street, Philadelphia, Pa.**

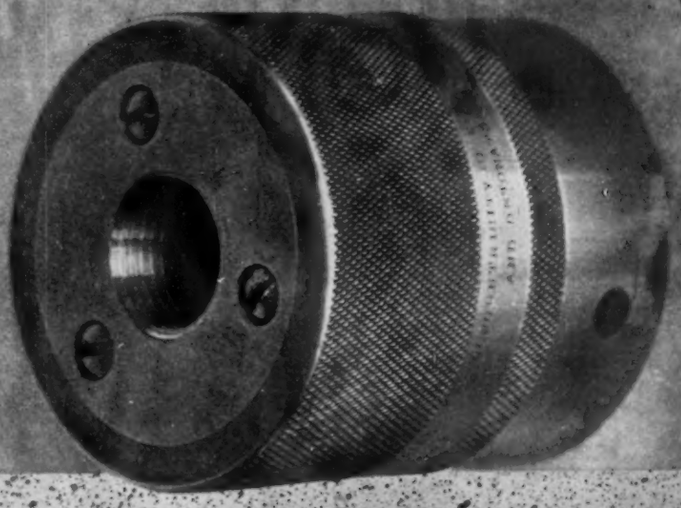
Sheffield

By means of our up-to-the-minute equipment and highly skilled workmen we are enabled to build into our tools the highest quality and longest service. We know your wants and can fill them.

*Send us your inquiries regarding our*

Thread Gauges, Deming Indicators and Thread Lead Checking Instruments

*The* SHEFFIELD MACHINE & TOOL CO., Dayton, Ohio



WANTED

**Work for Jones & Lamson Machines—Also Plain Lathe Work**

We can take on a quantity of

**JIG, FIXTURE, GAUGE AND DIE WORK**

**FORMED CUTTERS—SPECIAL MACHINERY**

We were the largest producers of thread gauges for the U. S. Government during the War and one of the largest producers of jig and fixture work for the various munition makers during the same period. *Can we serve you?*

**H. W. COTTON, Inc., Woolworth Building, New York City**

**Works: Brooklyn**

WANTED

**MACHINE WORK**

We are in position to build complete machines or any parts. Operate own foundry. Send us your blueprints.

HERMANCE MACHINE CO.
Williamsport, Pa.

# HEAVY CASTINGS

With unexcelled equipment for the economical handling of heavy gray iron castings, this foundry is at your service. Good castings in quick time.

*Wire—write—or phone*

**THE JAMES A. BRADY FOUNDRY CO.**

**4508 Western Ave., Chicago**

**QUICK DELIVERY ON MILLING CUTTERS**

End Mills, Mandrels, Dies, Jigs, Fixtures and special tools of all kinds.

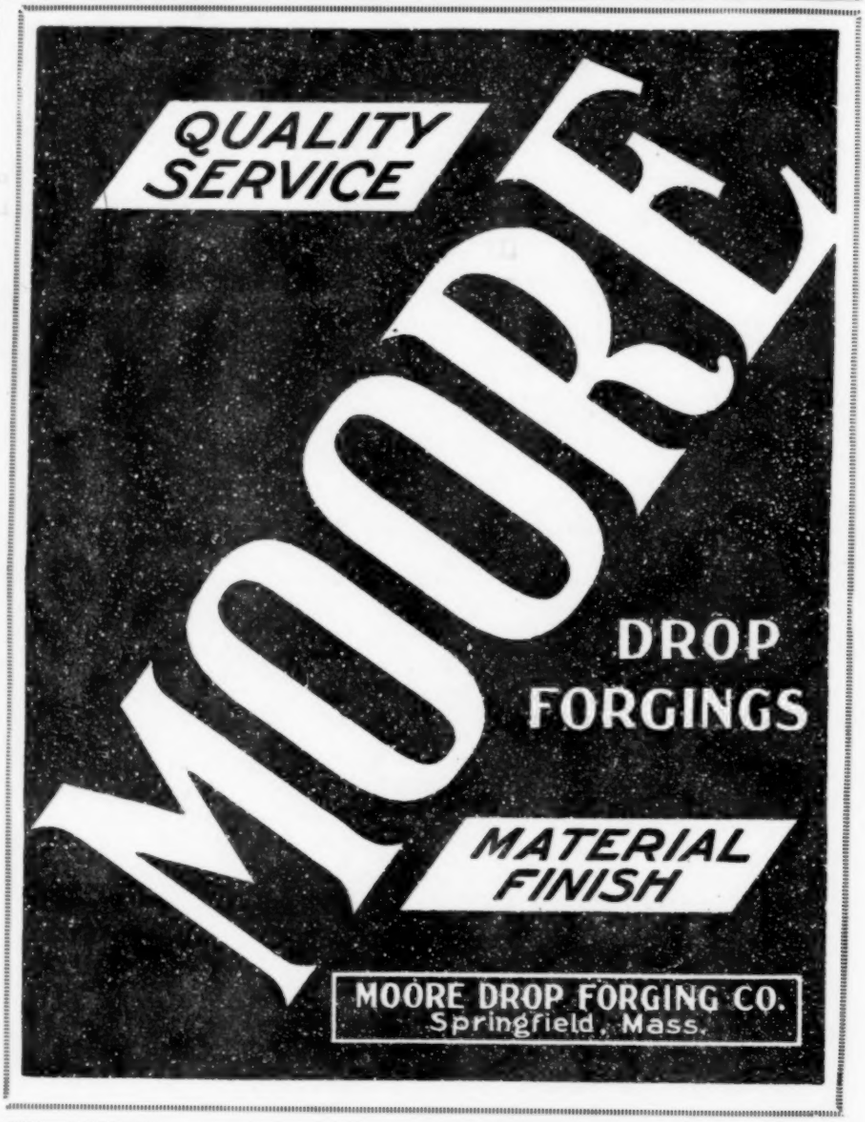
Our 25 years' experience is your assurance of quality and service.

CHAS. J. MOODY TOOL WORKS
60-62 River St., Elgin, Ill.

**PATTERNS**

**Wood and Metal**

Sweet & Doyle Fdry. & Mch. Co.
Green Island, Albany Co., N. Y.




**AETNA— OVER 40 YEARS AT WARREN, OHIO —AETNA**

**GREY IRON CASTINGS up to 20,000 lbs.** **WOOD PATTERNS**

**MACHINE WORK**

*Machine Manufacturers*—**The Aetna Foundry & Machine Co., Warren, Ohio.**

# Krasberg

## *Confidence*

Light, healthful working conditions such as Krasberg gives to his workman, are conducive to their best efforts in behalf of the firm of which they are a part.

The confidence of our customers is merited by years of faithful service. Each piece that leaves the Krasco plant is made by men who have confidence in their work, their employer, and their employer's interests.

Ideal conditions—clean surroundings—co-operation—these are to Krasberg as essentsal to efficiency as is good plant equipment.

Krasco Service is at your disposal. Send us blueprints of whatever you have to manufacture in a mechanical line—jigs, hobs, dies, special tools of all description—and we will be only too glad to quote you.

**Krasberg Engineering & Manufacturing Corporation**

536 Lake Shore Drive,
CHICAGO

*Contract Manufacturing*

SLOCUM - AVRAM - SLOCUM MANAGEMENT

**Designing**
**Developing**
**Manufacturing**
**Managing**

Is there some project staring you in the face that requires special tools or machinery?

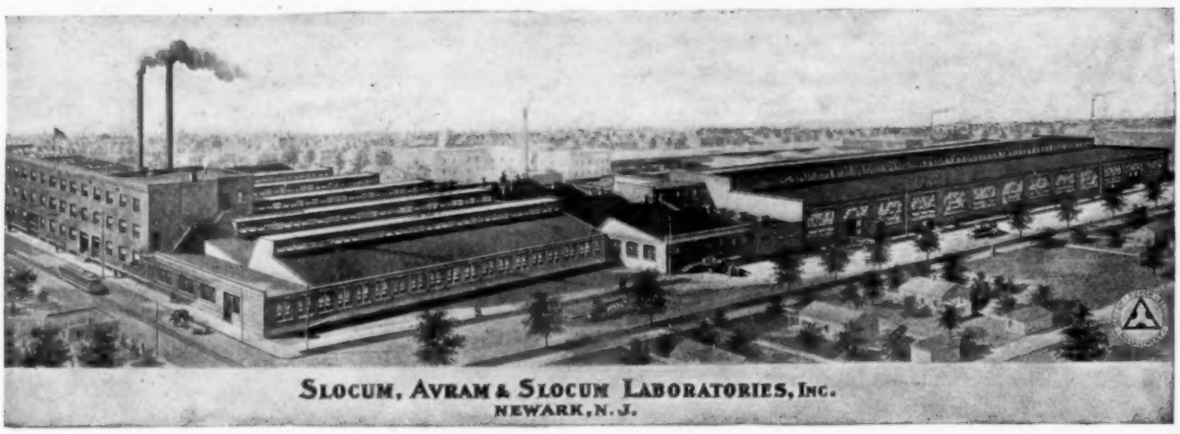
Have you extra work in your factory that overtaxes your present facilities?

If so, this organization will take over your responsibilities, either in part or entirely. In this plant you may have not only your special tools and machines built, but your ideas developed from the blue print designs to the delivery of your completed product to your customers.

*Here you may be sure of quantity production handled economically and rapidly.*

All you need is a sales organization and an idea. We'll manage the rest. Find out about our immense capacity for shouldering your work.

**Slocum, Avram & Slocum Laboratories, Inc.**
**Works: Newark, N. J. New York Office: Woolworth Building**



SLOCUM, AVRAM & SLOCUM LABORATORIES, INC.
NEWARK, N. J.

**WANTED**

Jig fixture work and gauge work, also small automatic machine building.

**Middletown Fire Arms & Specialty Co.**
Middletown, Conn.

DIES, GAUGES, FIXTURES, JIGS, SPECIAL TOOLS, ETC.
WILCOX MOTOR & MFG. CO.

Accurate
**Screw Machine Products**
Prompt deliveries. Shop fully equipped with highest class new machines. Estimates cheerfully furnished.
**Tock Screw Machine Products Corp.**
**199-203 Eighth Street, Long Island City, N. Y.**

**EXPERT DESIGNING**
of jigs, tools, special machinery, etc., will save you fortunes in first and manufacturing costs. Send blue prints—get estimates.
R. A. ALLEN
1650 East 66th St., Cleveland, Ohio

Organization, Modern Equipment and Manufacturing Facilities
**LET REAL TOOLMAKERS**
**Help You Tool Up For Your Manufacturing**
For QUANTITY PRODUCTION
MARF MACHINE CO., 17 Vandewater St., N. Y.

Difficult Drawing *and* Reducing
**DIES**
Blanking, Forming, Combination *and* Piercing
*Long Experience. Work Guaranteed*
J. MAUTE & SONS
23-25 KANE STREET, BUFFALO, N. Y.
*Consult Us!*

SPECIAL MACHINERY
TOOLS GAUGES
ASK US TO DO IT
It'll be done the way you want it at a price you'll like.
GEM CITY MACHINE CO.
DIES JIGS
DAYTON OHIO, U.S.A.

TOOL TRADE MEHL MADE MARK SERVICE

## There's at Least One Valuable Tool Hint on Every Page

Thirty-two pages mean at least 32 hints and every one the result of years of experience in tooling up jobs for shops throughout America—shops in every field of mechanical achievement. Pronounced the best book on the subject of tools ever published. Your copy awaits your request. No charge—no obligation.

Just clip the coupon and mail to us TO-DAY—NOW.

**Mehl Machine Tool & Die Co.**

**Roselle, N. J., 30 Minutes from N. Y. C.**

**Clip This Coupon Send To-Day**

To MEHL MACHINE TOOL & DIE CO.,
Roselle, New Jersey

Send me my copy of your new tool prospectus.

Name.....
Position.....
Company.....
Address.....

## Screw Machine Products

Flat Turret Lathe Work, Bar Stock Capacity 3-in., Chucking Capacity 18-in. We specialize in manufacturing Automobile and Machine Parts, Spur, Bevel Gears and Sprockets.

Let us figure on your requirements. Prompt deliveries; Reasonable Prices.

**ZUMBACH MACHINE CO.**
134-136 West 54th Street, New York City

**Layouts and Working Drawings**

of mechanical and electrical machinery made from sketches or specifications. Design of tools and special automatic machines.
**C. W. ENGINEERING CO.**
131 Nagle Ave., New York City

**ACCURACY EFFICIENCY**

Gauges Tools Dies — Special Machinery

ROBBINS GAMWELL & CO. PITTSFIELD, MASS.

**ROBBINS, GAMWELL & CO.**
Pittsfield, Mass.

High-Class Gauge Work → **For 18 Years** ← Accurate Punches and Dies

we have been manufacturing them—precision, careful workmanship and excellent material have been our watchwords. Write for information.

**The Simplex Tool Co., Woonsocket, R. I.**

**MacCordy Tool and Die Company**

Designers and Builders of
**Special Machinery, Tools, Dies, Jigs, Fixtures and Die Casting Dies**
Machines and Parts in Quantities Manufactured on Contract
**FULTON, N. Y.**

## CASTINGS
## BRASS·BRONZE·ALUMINUM

*SEND BLUEPRINTS AND SPECIFICATIONS*

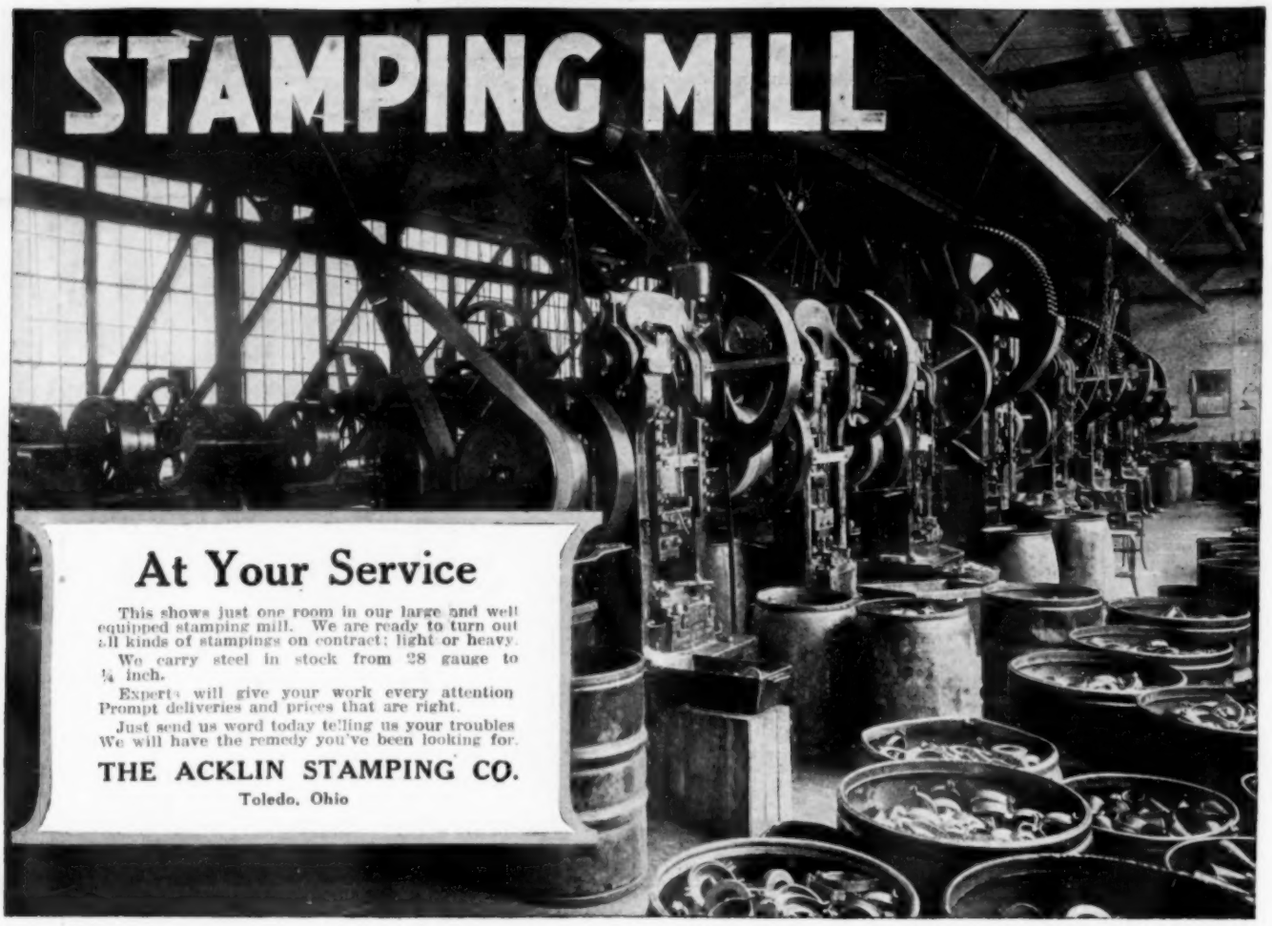
BRONZE BUSHINGS AND BARS CARRIED IN STOCK
CAST WELDING RODS

**THE IDEAL BRONZE CO.**
1255 E. 55th ST.
CLEVELAND OHIO

## Quality Screw Machine Products

**of all varieties milled from the solid bar. Detailed announcement in last week's issue.**

**Hartford Machine Screw Co.**
Main Office and Works: **Hartford, Ct.**




## At Your Service

This shows just one room in our large and well equipped stamping mill. We are ready to turn out all kinds of stampings on contract; light or heavy.

We carry steel in stock from 28 gauge to ¼ inch.

Experts will give your work every attention Prompt deliveries and prices that are right.

Just send us word today telling us your troubles We will have the remedy you've been looking for.

**THE ACKLIN STAMPING CO.**
Toledo, Ohio

## JIGS—GAUGES—FIXTURES

Piercing and Blanking Tools.
Die Sinking and Engraving.
Metal Stampings to Order.

***Our Tools Must Pass the Johansson Test.***

**THE FEENEY TOOL COMPANY**
751 Central Ave., Bridgeport, Conn.

**We can build and assemble complete machines for you, or manufacture special parts. Our factory consists of:**

Complete machine shops and tool rooms.
Sheet metal shop.
Woodworking shop.
Blacksmith shop.
Forge shop for small drop forgings.
Complete heat treating equipment.

*Ask us for Quotation.*

**BUFFALO PITTS COMPANY, Buffalo, N. Y.**

## Refined Malleable Castings

**LANCASTER FOUNDRY CO.**
Lancaster, Penna.

## Screw Machine Products

Work up to 2½ in. diameter can be handled with our increased facilities. Send us your specifications.

**THOS. H. DALLETT CO., Philadelphia, Pa.**

## Why Buy New Machines

### Why Not Let Us Do It?

We have the facilities for turning out that special job quickly and accurately. This means that you won't have to tie any money up in new machinery, won't even have to think of the job.

Jigs—Fixtures—Ring, Plug and Snap Gauges—Forming, Drawing and Sub Press Work—Blanking—Trimming—Piercing—Special Machine Work.

**Send Blueprints**

**THE COLUMBUS DIE, TOOL AND MACHINE COMPANY**
COLUMBUS, OHIO

**SPECIAL MACHINERY**
BUILT TO ORDER

We have splendid facilities for producing special machinery of all kinds, and are prepared to guarantee satisfaction—both as regards workmanship and price. We have foundry facilities and an up-to-date machine shop. Send us blue-prints and give us an opportunity to quote you price. We can save you money.

**Lambert & Todd Machine Co., Camden, N. J.**

# CONTRACT WORK

**Building Special Machinery *Since* 1875**

## Specialists in Special Machinery

Our Guarantee is backed by over 40 years of quality workmanship—a reputation for unfailing deliveries, thoroughness, reliability.

We are used to close tolerances, accurate gauge work, rigid inspection methods.

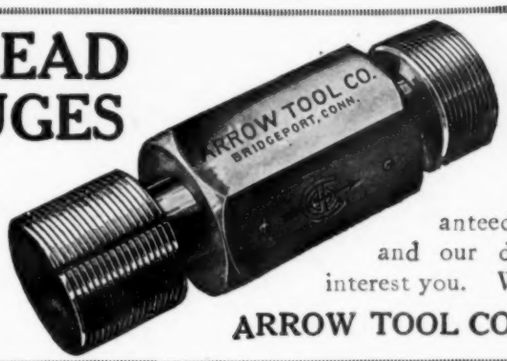
Cowdrey methods deliver only machinery that is ready for use in every respect in accordance with your order.

You incur not the slightest obligation by writing us and we will reply promptly and in full.

C. H. COWDREY MACHINE WORKS
20 Summer Street FITCHBURG, MASSACHUSETTS

## THREAD GAUGES

of all sizes and all types, both standard and special.




We specialize on Thread Gauges and the accuracy of every gauge is guaranteed. Our prices and our deliveries will interest you. Write today.

ARROW TOOL CO., 200 Cannon St. Bridgeport, Ct.

## FRANKLIN MACHINE CO.

**Engineers, Founders and Machinists**
PROVIDENCE, R. I.

Iron Castings, Shafting, Hangers, Pulleys, Etc. Special Textile Machinery, Heavy Machinery for Steel, Rubber and Paper Mills

*and*

THE HARRIS-CORLISS STEAM ENGINE

## Gear Shaper Capacity

### AT YOUR SERVICE

We have two Fellows Gear Shapers, 36-in. machines, that we are now in position to cut gears on for immediate delivery.

Send us blue prints or samples, advising us quantity required and we will quote price.

**Stevens-Duryea Co., Chicopee Falls, Mass.**

## PATTERNS

Wood and Metal.
Dies, Tools and Gages;
Light Machine Work.
Write
MODERN MACHINE & PATTERN CO.
Terre Haute, Ind.

MARVIN URBANA O.

## DIES

GAUGE
Fixtures
Special Machinery

THE W. B. MARVIN MFG. CO., Urbana, O.

## Machine Contract Work

WANTED

Thoroughly equipped with modern machine shops, we can render prompt and efficient service.
Special Machinery Building and Contract for Parts Solicited.
STRATTON & BRAGG CO., Petersburg, Va.

LET US DESIGN AND BUILD
YOUR
TOOLS, DIES
JIGS and FIXTURES
*All work guaranteed*
THE BUDD-RNEYAN
ENGINEERING CO.
COLUMBUS, OHIO

WHEN YOU NEED ANY
Experimental Apparatus in the development of your product, special machines needed in the manufacture of your output jigs, fixtures or any kind of high grade machine work, I have machine tools, expert workmen and engineers at your service
A. H. EMERY
Tel. Stamford, Conn. Glenbrook, Conn.

TURRET
LATHE
WORK
BAR AND CHUCKING
HEAT TREATING
GENERAL
MACHINE WORKS
YORK, PA.

Tools Gauges THE Special Cutters
E. W. CARPENTER
MFG. CO.
Jigs Fixtures Bridgeport Conn. Special Machinery

AUTOMATIC
Screw Machine Products
Stampings and Castings
Machine Work
Wire and Metal Work
Special Machinery
Complete Assemblies
Union
Manufacturing Co.
116 Humboldt St.
Union Hill, New Jersey
*Low Overhead*

FORGINGS
That save you money in machining and finishing. From a few to 10,000 pounds
Write us today.
THE JOHNSTON & JENNINGS CO.
Cleveland, Ohio, U. S. A.

Want Any?
CONTRACT WORK
Any to Let?

Humphrey Die and Tool Corp.
*Designers and Makers of*
Dies, Tools and Appliances for
Sheet and Plate Metal Products
*Office and Works:* SALEM, N. Y.

TOOL ROOM PRODUCTS TRADE MARK
DIES JIGS GAUGES
Fixtures, Special Tools, Tool Designing.
Special Machinery and Sheet Metal Stampings.
Pronounced Accuracy—Send Us Your Orders.
MOORE & CO. Grand Ave & Franklin St. Chicago

Complete Machines or
Parts Manufactured
Special Machinery Made. Medium and Heavy Planing, Boring, Turning, etc.
Shepherd Engineering Co., Williamsport, Pa.

BRASS SCREW MACHINE
PRODUCTS
Ranging from ¼ in. to 2½ in. diameter. We have large and excellent facilities, and if it can possibly be made on a screw machine, we can make it. Send us your blueprints or samples and we will quote you prices.
ANSONIA MFG. CO., Ansonia, Conn., U. S. A.

DIES
Forming, Blanking and Drawing
Jigs—Fixtures
SUPERIOR TOOL & DIE WORKS
313 So. Clinton St., Chicago, Ill.

# Eliminate Waste

Work done by the advertisers in the Contract Work Section of the *American Machinist* reaches you in a finished state. All defects in materials or workmanship are borne by the fellow who accepts your job. You buy an inspected product with no overhead waste.

This is a point deserving consideration among modern manufacturers.

**Contract Work Section**

# CONTRACT WORK



## Turn Over That Work To Us!

*We'll make your—*
*TOOLS, FIXTURES*
*and*
*MACHINE WORK*

*For*

Lathes up to 24 in.
Drills up to 72 in.
Planers up to 60 in.
Milling Machines.
Automatic Screw Machines up to 6¾ in.

*Excellent facilities for general manufacturing. Estimates promptly furnished.*

**Becker Milling Machine Co.**
Hyde Park, Boston, Mass.

---

**E.G. MUNSON, Utica, N.Y.**
GREY IRON CASTINGS
PATTERN WORK (Wood & Iron)
MACHINE WORK
**The building and mounting of patterns for moulding machines a specialty.**

---

*Hand in Hand*

Quantity production and quality production are one and inseparable in the making of special

**Corbin Automatic Screw Machine Products**

We are admirably equipped to make anything, up to 4¼ in. in diameter, that can be produced by modern automatic screw machines. Always absolute uniformity and highest quality of materials and workmanship.
Orders promptly executed. Quotations on receipt of Specifications, Samples, or Blueprints.

**CORBIN SCREW CORPORATION**
*American Hardware Corporation*
Successor
*New Britain, Conn.*
*BRANCHES:*
New York Chicago Philadelphia

---

**PREMIER MACHINE TOOL WORKS, Inc.**

Special Machines
Fixtures
Tools
Jigs
Dies
Etc.

All kinds of machine shop work new or repair

Oxy-acetylene welding

*First class work*
*Reasonable price*
*Quick service*

*Write*

Industrial Building
Albany, N. Y.

---

**SCREW MACHINE WORK**

SPECIAL PARTS TURNED FROM BRASS, STEEL AND IRON

ERICSSON SCREW MACHINE PRODUCTS CO., INC.
607-609 BERGEN STREET, BROOKLYN, N.Y.

---

# MODERN

**TOOL DIE MACH. CO.**
214-220 N. 4th St., Columbus, Ohio
*Designers and Builders of*

**1st CLASS TOOLS — GAUGES DIES — FIXTURES**

---

# ROOT

**STAMPINGS**
**GET OUR PRICES**

Sheet Metal Stampings, Brass, Bronze, Copper, Steel or Aluminum. Any size up to 4 in. x 6 in. Any quantities. Prompt shipment.

**THE C. J. ROOT CO.**
Flemming St., Bristol, Conn.

---

DODGE QUALITY SERVICE TOOLS

## *Quick Action!*

That's what your orders for special Dies, Jigs, Gauges and Fixtures get when sent to Dodge. Try our service once; you'll like it.

**DODGE TOOL COMPANY**
**Grinnell, Iowa**

---

## *We Build Anything*

in light and medium machinery, any quantity. Tools, Fixtures, Jigs and Dies for interchangeable production Experimental and model work.

**Berggren & Pearson Machine Co.**
Incorporated
221-227 Canal Street, New York City

---

We specialize in the manufacture of

**Dies, Jigs, Fixtures and Gauges**

special machinery and tool designing. We solicit your inquiries. Send us blueprints and let us quote you.

**WEBER & SCHER MFG. CO.**
24 Scott St., Newark, N. J.

---

**Tool Room Work of the better class**

and the building of special machinery and parts is our business.

**The Hartford Special Machinery Co.**
Hartford, Conn

---

**Hooth & Stewart**
CONSULTING ENGINEERS

DESIGNERS OF

**Trucks — Tractors — Passenger Cars Their Units and Tools**

410 Press Building
KALAMAZOO, MICHIGAN

# WHAT AND WHERE TO BUY

## A Classified Index of Advertisers in This Issue

For Alphabetical Index See Last Page

**Abrasive Discs**
Badger Tool Co., Beloit, Wis.
Besly & Co., Charles H., Chicago, Ill.
Carborundum Co., Niagara Falls, N. Y.
Gardner Machine Co., Beloit, Wis.

**Abrasive Materials**
Carborundum Co., Niagara Falls, N. Y.
Cutter & Wood Supply Co., Boston, Mass.
Dickinson, Thos. L., 64 Nassau St., N. Y.
Gardner Machine Co., Beloit, Wis.
Hampden Corundum Wheel Co., Springfield, Mass.
Maxf Grinding Wheel Corp., Chester, Mass.
Norton Co., Worcester, Mass.
Safety Emery Wheel Co., Springfield, Ohio.
Vitrified Wheel Co., Westfield, Mass.

**Accumulators, Hydraulic**
Elmes Engineering Wks., Chas. F., Chicago.
Watson-Stillman Co., 42 Church St., N. Y. City.
Worthington Pump & Mchy. Corp., N. Y. City

**Air Lifts**
Ingersoll-Rand Co., 11 Broadway, N. Y.
Worthington Pump & Mchy. Corp., N. Y. City.

**Air Purifiers and Coolers**
Worthington Pump & Mchy. Corp., N. Y. City.

**Analyses, Chemical**
Souther Engineering Corp., Hy., Hartford, Conn.

**Angle Plates**
Boston Scale & Machine Co., Boston.
Nelson Tool & Machine Co., Newark, N. J.
Reid Brothers Co., Beverly, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

**Arbors**
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling Machine Co., Cincinnati, O
Cleveland Twist Drill Co., Cleveland ,Ohio.
Cochrane-Bly Co., Rochester, N. Y.
Cushman Chuck Co., Hartford, Conn.
Detroit Twist Drill Co., 644 Fort St., Detroit.
Lincoln Twist Drill Co., Taunton, Mass.
Morse Twist Drill & Mach. Co., New Bedford,Mass.
Nicholson & Co., W. H., Wilkes-Barre, Pa.
Standard Engineering Works, Pawtucket, R. I.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Union Mfg. Co., New Britain, Conn.
Westcott Chuck Co., Oneida, N. Y.
Whitney Mfg. Co., Hartford, Conn.

**Babbitt Metal**
Williams & Son, E. A., Jersey City, N. J.

**Balancing Machines**
Norton Co., Worcester, Mass.

**Balancing Ways**
Anderson Bros. Mfg. Co., Rockford, Ill.

**Ball Retainers**
Bearings Co. of America, Lancaster, Pa.

**Balls, Brass, Bronze and Steel**
Abbott Ball Co., Box 1233, Hartford, Conn.
Auburn Ball Bearing Co., Rochester, N. Y.
Boker & Co., H., 101 Duane St., N. Y. City
Gwilliam Co., 253 W. 58th St., N. Y. C.
Hoover Steel Ball Co., Ann Arbor, Mich.
New Departure Mfg. Co., Bristol, Conn.

**Barrels, Tumbling**
Abbott Ball Co., Box 1233, Hartford, Conn.
Cleveland Twist Drill Co., Cleveland ,Ohio.
Royersford Fdry. & Mach. Co., Royersford, Pa.
Whiting Foundry Equipment Co., Harvey, Ill.

**Bars, Boring**
Gisholt Machine Co., Madison, Wis.
Marvin & Casler Co., Canastota, N. Y.
Underwood Corp., H. B., Philadelphia, Pa.

**Bars, Bronze Cored**
American Bronze Corp., Berwyn, Pa.
Bunting Brass & Bronze Co., Toledo, Ohio
Williams & Son, E. A., Jersey City, N. J

**Bars, Steel**
Camden Forge Co., Camden, N. J.
Carnegie Steel Co., Pittsburgh, Pa.

**Bearings, Ball**
Auburn Ball Bearing Co., Rochester, N. Y.
Bearings Co. of America, Lancaster, Pa.
Fafnir Bearing Co., New Britain, Conn.
Federal Bearings Co., Inc., Poughkeepsie, N. Y.
Gurney Ball Bearing Co., Jamestown, N. Y.
Gwilliam Co., 253 W. 58th St., N. Y. C.
New Departure Manufacturing Co., Bristol, Conn.
Norma Co. of America, 1790 Broadway, N. Y. C.
Schatz Mfg. Co., Poughkeepsie, N. Y.
S K F Industries, Inc., Hartford, Conn.
Transmission Ball Bearing Co., Buffalo, N. Y.

**Bearings, Bronze**
American Bronze Corp., Berwyn, Pa.
Bunting Brass & Bronze Co., Toledo, Ohio.
Doehler Die Casting Co., Brooklyn, N. Y.
Williams & Son, E. A., Jersey City, N. J.

**Bearings, Die-Cast**
Doehler Die Casting Co., Brooklyn, N. Y.
Franklin Mfg. Co., Syracuse, N. Y.
Light Mfg. & Foundry Co., Pittsburgh, Pa.

**Bearings, Journal**
American Bronze Corp., Berwyn, Pa.
Arguto Oilless Bearing Co., Philadelphia, Penn.
Bunting Brass & Bronze Co., Toledo, Ohio
Columbus Brass Co., Columbus, Ohio.
Hart Roller Bearing Co., Orange, N. J.
Laminated Shim Co., 533 Canal St., N. Y. City.
Mass. Oilless Bearing Co., Worcester, Mass.
Williams & Son, E. A., Jersey City, N. J.

**Bearings, Roller**
Gwilliam Co., 253 W. 58th St., N. Y. C.
Hart Roller Bearing Co., Orange, N. J.
Hyatt Roller Bearing Co., Harrison, N. J.
Norma Co. of America, 1790 Broadway, N. Y. C
Royersford Fdry. & Mach. Co., Royersford, Pa.

**Belt Cement**
Graton & Knight Mfg. Co., Worcester, Mass.
Ladew Co., Edw. R., Glen Cove, N. Y.
Schieren Co., Chas. A., 41 Ferry St., N. Y. City.

**Belt Clamps**
Hoggson & Pettis Mfg. Co., New Haven, Conn.

**Belts, Abrasive**
Blevney Machine Co., Greenfield, Mass.

**Belt Dressings and Fillers**
Graton & Knight Mfg. Co., Worcester, Mass.
Ladew Co., Edw. R., Glen Cove, N. Y.
Schieren Co., Chas. A., 41 Ferry St., N. Y. City.
Texas Co., 17 Battery Place, N. Y.
White & Bagley Co., Worcester, Mass.

**Belt Fasteners**
Bristol Co., Waterbury, Conn.
Flexible Steel Lacing Co., Chicago, Ill.

**Belt Lacing**
Chicago Rawhide Mfg. Co., Chicago, Ill.
Graton & Knight Mfg. Co., Worcester, Mass
Ladew Co., Edw. R., Glen Cove, N. Y.
Schieren Co., Chas. A., 41 Ferry St., N. Y. City.

**Belt Lacing Machines**
Birdsboro Steel Fdry. & Mach. Co., Birdsboro, Pa.
Flexible Steel Lacing Co., Chicago, Ill.

**Belt Shifters**
LeBlond Mach. Tool Co., The, R. K., Cincinnati.

**Belting, Chain**
Link-Belt Co., Chicago, Philadelphia.
Morse Chain Co., Ithaca, N. Y.
Whitney Mfg. Co., Hartford, Conn.

**Belting, Endless**
Brown Mfg. Co., Arthur S., Tilton, N. H

**Belting, Fabric**
Rossendale-Reddaway B. & H. Co., Newark, N. J.

**Belting, Leather**
Chicago Rawhide Mfg. Co., Chicago, Ill.
Graton & Knight Mfg. Co., Worcester, Mass.
Ladew Co., Edw. R., Glen Cove, N. Y.
N. Y. Leather Belting Co., Worcester, Mass.
Rhoads & Sons, J. E., 32 N. 3rd St., Phila, Pa.
Schieren Co., Chas. A., 41 Ferry St., N. Y. City.

**Bench Countershaft Standards**
New Britain Machine Co., New Britain, Conn.

**Bench Drawers**
Lyon Metallic Mfg. Co., Aurora, Ill.
New Britain Machine Co., New Britain, Conn.

**Benches, Work**
Lyon Metallic Mfg. Co., Aurora, Ill.
Manufacturing Equipment & Engineering Co., Framingham, Mass.
New Britain Machine Co., New Britain Conn.
Western Tool & Mfg. Co., Springfield, Ohio.

**Bench Legs**
Brown & Sharpe Mfg. Co., Providence, R. I.
Lyon Metallic Mfg. Co., Aurora, Ill.
Manufacturing Equipment & Engineering Co., Framingham, Mass.
New Britain Machine Co., New Britain, Conn

**Bending Machines, Power**
Niles-Bement-Pond Co., 111 Broadway, N. Y. C.
Toledo Mach. & Tool Co., Toledo, Ohio.

**Blocks**
Taft-Peirce Mfg. Co., Woonsocket, R. I.

**Blocks, Chain (See Hoists, Hand)**

**Blocks, Die**
Camden Forge Co., Camden, N. J.
Halcomb Steel Co., Syracuse, N. Y.

**Blocks, Pillow**
Gurney Ball Bearing Co., Jamestown, N. Y.

**Blocks, Machine Set-up**
Standard Drop Equipment Co., Philadelphia, Pa.

**Blowers**
American Gas Furnace Co., 24 John St., N. Y. C.
Chicago Flexible Shaft Co., Chicago, Ill.
Eclipse Fuel Engineering Co., Rockford, Ill.
General Electric Co., Schenectady, N. Y.
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.

**Blueprinting Machinery**
Buckeye Engine Co., Salem, Ohio.
Wickes Bros., Saginaw, Mich.

**Blueprints**
Wickes Bros., Saginaw, Mich.

**Bolt and Nut Machinery**
Acme Machinery Co., Cleveland, Ohio.
Greenfield Tap & Die Corp., Greenfield, Mass.
Landis Machine Co., Waynesboro, Pa.
National Machinery Co., Tiffin, Ohio.
Newton Mach. Tool Wks., Philadelphia, Penn.
Universal Machine Co., Bowling Green, Ohio.
Victor Tool Co., Waynesboro, Penn.

**Bolts and Nuts**
Hartford Machine Screw Co., Hartford, Conn.
National Acme Co., Cleveland, Ohio.
Russell Burdsall & Ward Bolt and Nut Co., Port Chester, N. Y.
Standard Shop Equipment Co., Philadelphia, Pa.

**Bolts, T Head**
Standard Shop Equipment Co., Philadelphia, Pa.

**Books, Technical**
McGraw-Hill Book Co., 239 W. 39th St., N. Y. C

**Boosters**
Crocker-Wheeler Co., Ampere, N. J.
General Electric Co., Schenectady, N. Y.
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa

**Boring and Turning Mills, Vertical**
Betts Machine Co., Rochester, N. Y.
Bickford & Co., H., Lakeport, N. H.
Bullard Machine Tool Co., Bridgeport, Conn.
Cincinnati Planer Co., Cincinnati, Ohio.
Colburn Mach. Tool Co., Franklin, Penn.
Gisholt Machine Co., Madison, Wis.
King Mach. Tool Co., Cincinnati, O.
Newton Mach. Tool Wks., Philadelphia, Pa.
Niles-Bement-Pond Co., 111 Broadway, N. Y. C.
Rogers Machine Tool Co., Alfred, N. Y.
Sellers & Co., Wm., Philadelphia, Penn

**Boring, Drilling and Milling Machines, Horizontal**
Barnes Co., W. F. & John, Rockford, Ill.
Baush Machine Tool Co., Springfield, Mass.
Beaman & Smith Co., Providence, R. I.
Betts Machine Co., Rochester, N. Y.
Cleveland Mach. Tool Co., Cleveland.
Coats Mach. Tool Co., 108-112 W. 40th St., N.Y.C.
Dale-Brewster Machinery Co., Chicago, Ill.
Defiance Machine Works, Defiance, Ohio.
Gidding & Lewis Mfg. Co., Fond du Lac, Wis
Gisholt Machine Co., Madison, Wis.
Hoefer Mfg. Co., Freeport, Ill.
Landis Tool Co., Waynesboro, Pa.
Lucas Machine Tool Co., Cleveland.
Moline Tool Co., Moline, Ill.
Newton Mach. Tool Wks., Philadelphia, Penn.
Niles-Bement-Pond Co., 111 Broadway, N. Y. C.
Pawling & Harnischfeger Co., Milwaukee, Wis.
Pedrick Tool & Machine Co., Philadelphia.
Prentiss & Co., Henry, Singer Bldg., N. Y. City.
Sellers & Co., Wm., Philadelphia, Penn.
Springfield Machine Tool Co., Springfield, Ohio
Universal Boring Machine Co., Hudson, Mass.
Vandyck Churchill Co., 93 Liberty St., N. Y. C.

**Boring, Drilling and Milling Mach., Vertical**
Betts Machine Co., Rochester, N. Y.
Cochrane-Bly Co., Rochester, N. Y.

**Boring Heads**
Davis Boring Tool Co., St. Louis, Mo.
Marvin & Casler Co., Canastota, N. Y.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Waterston, J. M., 77 Woodward Ave., Detroit

**Boring Tools**
Armstrong Bros. Tool Co., Chicago.
Brown & Sharpe Mfg. Co., Providence, R. I.
Davis Boring Tool Co., St. Louis.
Hall Mfg. Co., Abington, Mass.
Independent Pneumatic Tool Co., Chicago, Ill.
Kelly Reamer Co., Cleveland, Ohio
Lovejoy Tool Co., Springfield, Vt.
Parker Machine Co., 221 High St., Boston
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Union Tool Co., Orange, Mass.
Western Tool & Mfg. Co., Springfield, Ohio
Williams & Co., J. H., Brooklyn, N. Y. City

**Boxes, Tote (See Furniture, Machine Shop)**

**Broaches**
Lapointe Co., J. N., New London, Conn.
Lapointe Machine Tool Co., Hudson, Mass.
La Pointe Co., V. E., Manchester, Conn.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

**Broaching Machines**
Lapointe Co., J. N., New London, Conn.
Lapointe Machine Tool Co., Hudson, Mass.
La Pointe Co., V. E., Manchester, Conn.

**Bronze**
American Bronze Corp., Berwyn, Pa.
Bunting Brass & Bronze Co., Toledo, Ohio.
Lumen Bearing Co., Buffalo, N. Y.
Williams & Son, E. A., Jersey City, N. J.

**Bronze, Phosphor**
Bunting Brass & Bronze Co., Toledo, Ohio.

**Bucket Carriers, Pivoted**
Link-Belt Co., Chicago, Philadelphia.

**Buffing or Polishing Machine (See Polishing and Buffing Machines)**

**Bulldozers**
Toledo Mach. & Tool Co., Toledo, Ohio.

**Burners, Oil and Gas**
Best, W. N., 11 Broadway, N. Y. City.
Gilbert & Barker, Mfg. Co., Springfield, Mass.
Johnson Gas Appliance Co., Cedar Rapids, Iowa
Tate, Jones & Co., Pittsburgh, Pa.

**Bushings**
American Bronze Corp., Berwyn, Pa.
Bunting Brass & Bronze Co., Toledo, Ohio.
Columbus Brass Co., Columbus, Ohio.
Ideal Bronze Co., 1265 E. 55 St., Cleveland.
Lumen Bearing Co., Buffalo, N. Y.
Williams & Son, E. A., Jersey City, N. J.

**Cabinets, Tool**
Armstrong Bros. Tool Co., Chicago.
Lyon Metallic Mfg. Co., Aurora, Ill.

**Calipers**
Athol Machine Co., Athol, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Slocomb Co., J. T., Providence, R. I.

# The Hoover Laboratories Write the Specifications for Hoover Steel Balls

To the Hoover Laboratories falls the vital responsibility of maintaining Hoover quality.

The careful tests and researches carried on here not only cover all the materials which enter into the making of steel balls, but the the manufacturing methods as well.

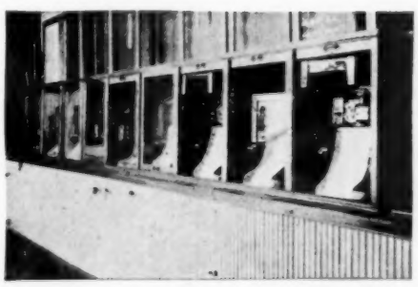
For instance, the work of the engineering staff is divided into two divisions.

The first is called "Research"—and the second is called "Control."

In the Research Division investigations are made upon which to base the definite Hoover standards—to write the specifications for the steel, the many varieties of oils and greases, grinding and polishing wheels, abrasives and all other materials which enter into the manufacture of Hoover Steel Balls.

In the "Control" Division the entire attention is devoted to seeing that these specifications are followed without exception——daily tests are run in the various stages of manufacture to detect the slightest deviation from Hoover standards.

Thus, the final quality of Hoover Steel Balls is removed entirely from the Domain of Chance—and reduced to a scientific certainty.



Photograph of the equipment which indicates and records the temperature under which Hoover Steel Balls are automatically heat treated. This results in absolute uniformity of structure and hardness. Such balls prove of maximum durability even in the most severe service.

**Hoover Steel Ball Company**
**Ann Arbor, Mich.**

HOOVER
STEEL BALLS

Starrett Co., L. S., Athol, Mass.
Union Tool Co., Orange, Mass.

**Cam Cutting Machines**
Cochrane-Bly Co., Rochester, N. Y.
Garvin Machine Co., N. Y. City.
Rowbottom Machine Co., Waterbury, Conn.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

**Cams**
Rowbottom Machine Co., Waterbury, Conn.

**Can-Making Machinery (See Sheet Metal Working Machinery)**

**Casters**
Hamilton Caster & Mfg. Co., Hamilton, Ohio.

**Castings, Aluminum**
Acme Die Cast. Corp., Bush Ter. 3, Brooklyn.
Bunting Brass & Bronze Co., Toledo, Ohio.
Doehler Die Casting Co., Brooklyn, N. Y.
Ideal Bronze Co., 1265 E. 55 St., Cleveland.
Light Mfg. & Foundry Co., Pottstown, Penn.
Stewart Mfg. Corp., Chicago, Ill.

**Castings, Brass and Bronze**
American Bronze Corp., Berwyn, Pa.
Bunting Brass & Bronze Co., Toledo, Ohio.
Columbus Brass Co., Columbus, Ohio.
Doehler Die Casting Co., Brooklyn, N. Y.
Ideal Bronze Co., 1265 E. 55 St., Cleveland.
Imperial Brass Mfg. Co., Chicago.
Light Mfg. & Foundry Co., Pottstown, Penn.
Lumen Bearing Co., Buffalo, N. Y.
Pangborn Corp., Hagerstown, Md.
Stewart Mfg. Corp., Chicago, Ill.
Williams & Son, E. A., Jersey City, N. J.

**Castings, Die Molded**
Acme Die Cast. Corp., Bush Ter. 3, Brooklyn.
Doehler Die Castings Co., Brooklyn, N. Y.
Franklin Mfg. Co., Syracuse, N. Y.
Light Mfg. & Foundry Co., Pottstown, Penn.
Lumen Bearing Co., Buffalo, N. Y.
Marf Machine Co., 17 Vandewater St., N. Y. C.
National Lead Co., 111 Broadway, N. Y.
Precision Castings Co., Inc., Syracuse, N. Y.
Stewart Mfg. Corp., Chicago, Ill.

**Castings, Iron**
Aetna Foundry & Mach. Co., Warren, Ohio.
Athol Machine Co., Athol, Mass.
Birdsboro Steel Fdy. & Mach. Co., Birdsboro, Pa.
Brady Foundry Co., Jas. A., Chicago, Ill.
Brown & Sharpe Mfg. Co., Providence, R. I.
Caldwell & Son Co., H. W., Chicago, Ill.
Chisholm-Moore Mfg. Co., Cleveland, Ohio.
Farrell Foundry & Machine Co., Ansonia, Conn.
Franklin Machine Works, Providence, R. I.
Lancaster Foundry Co., Lancaster, Pa.
Munson, E. G., Utica, N. Y.
Springfield Mach. Tool Co., Springfield, Ohio.
Whitcomb-Blaisdell Mach. Tool Co., Worcester.

**Castings, Nichrome**
Driver-Harris Co., Harrison, N. J.

**Castings, Semi-Steel**
Farrell Fdy. & Mach. Co., Ansonia, Conn.
Pangborn Corp., Hagerstown, Md.
Springfield Mach. Tool Co., Springfield, Ohio.

**Cements, Iron**
Hilo Varnish Corporation, Brooklyn, N. Y.
Smooth-On Mfg. Co., Jersey City, N. J.

**Centering Machines**
Cadillac Tool Co., Detroit, Mich.
Hendey Mach. Co., Torrington, Conn.
Niles-Bement-Pond Co., 111 Broadway, N. Y. C.
Standard Engineering Wks., Pawtucket, R. I.
Whiton Mach. Co., D. E., New London, Conn.

**Centers, Planer**
Cincinnati Planer Co., Cincinnati, Ohio.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Woodward & Powell Planer Co., Worcester.

**Chains (See Sprockets and Chains)**

**Chain, Driving**
Baldwin Chain & Mfg. Co., Worcester, Mass.
Boston Gear Wks., Norfolk Downs, Quincy, Mass.
Link-Belt Co., Philadelphia, Chicago.
Morse Chain Co., Ithaca, N. Y.
Whitney Mfg. Co., Hartford, Conn.

**Chasers**
Bay State Tap & Die Co., Mansfield, Mass.

**Chemists**
Souther Engineering Corp., Hy., Hartford, Conn.

**Chucking Machines**
Brown & Sharpe Mfg. Co., Providence, R. I.
Bullard Machine Tool Co., Bridgeport, Conn.
Cleveland Auto Mach. Co., Cleveland.
Gisholt Machine Co., Madison, Wis.
Jones & Lamson Machine Co., Springfield, Vt.
McDonough Mfg. Co., Eau Claire, Wis.
New Britain Machine Co., New Britain, Conn.
Potter & Johnston Mach. Co., Pawtucket, R. I.
Warner & Swasey Co., Cleveland.

**Chucks, Centering**
Carroll-Jamieson Mach. Tool Co., Batavia, Ohio.
Cushman Chuck Co., Hartford, Conn.
Thomas Elevator Co., 20 S. Hoyne Ave., Chicago.
Westcott Chuck Co., Oneida, N. Y.

**Chucks, Drill and Tap**
Almond Mfg. Co., T. R. Ashburnham, Mass.
American Machine Co., Hartford, Conn.
American Pneumatic Chuck Co., Chicago, Ill.
Bicknell-Thomas Co., Greenfield, Mass.
Clark Equipment Co., Buchanan, Mich.
Cleveland Twist Drill Co., Cleveland ,Ohio.
Cushman Chuck Co., Hartford, Conn.
Eastern Tube & Tool Co., Brooklyn, N. Y.
Hammacher, Schlemmer & Co., N. Y. City.
Horton & Son Co., E., Windsor Locks, Conn
Marvin & Casler Co., Canastota, N. Y.
Modern Tool Co., Erie, Penn.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Peter Bros. Mfg. Co., Algonquin, Ill.
Pratt Chuck Co., Frankfort, N. Y.
Rich Tool Co., Railway Exchange, Chicago.
Scully-Jones Co., 649 Railway Exc., Chicago.
S K F Industries, Inc., Hartford, Conn.
Skinner Chuck Co., New Britain, Conn.
Standard Tool Co., Cleveland, Ohio.
Union Mfg. Co., New Britain, Conn.
Victor Tool Co., Waynesboro, Penn.
Wahlstrom Tool Co., Brooklyn, N. Y.
Westcott Chuck Co., Oneida, N. Y.
Whitney Mfg. Co., Hartford, Conn.
Whiton Mach. Co., D. E., New London, Conn.

**Chucks, Lathe**
Advance Tool Co., Cincinnati, Ohio.
Almond Mfg. Co., T. R., Ashburnham, Mass.
American Pneumatic Chuck Co., Chicago, Ill.
Bullard Machine Tool Co., Bridgeport, Conn.
Cushman Chuck Co., Hartford, Conn.
Gisholt Mach. Co., Madison, Wis.
Hoggson & Pettis Mfg. Co., New Haven, Conn.
Horton & Son Co., E., Windsor Locks, Conn.
Pratt Chuck Co., Frankfort, N. Y.
Simplex Tool Co., Woonsocket, R. I.
Skinner Chuck Co., New Britain, Conn.
Terkelsen & Wennberg, Boston, Mass.
Thomas Elevator Co., 20 S. Hoyne Ave., Chicago
Union Mfg. Co., New Britain, Conn.
Westcott Chuck Co., Oneida, N. Y.
Whiton Mach. Co., D. E., New London, Conn.

**Chucks, Magnetic**
D & W Fuse Co., Providence.
Heald Mach. Co., Worcester, Mass.
Persons-Arter Mach. Co., Worcester, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Walker Co., O. S., Worcester, Mass.
Worcester Machine Works, Worcester, Mass.

**Chucks, Planer**
American Pneumatic Chuck Co., Chicago, Ill.
Cincinnati Planer Co., Cincinnati, Ohio.
D & W Fuse Co., Providence.
Hoggson & Pettis Mfg. Co., New Haven, Conn.
Horton & Son Co., Windsor Locks, Conn.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.
Walker Co., O. S., Worcester, Mass.

**Chucks, Split**
Ames Co., B. C., Waltham, Mass.
Rivett Lathe & Grinder Co., Brighton, Boston.
Seneca Falls Mfg. Co., Seneca Falls, N. Y.
Sloan & Chace Mfg. Co., Newark, N. J.
Stark Tool Co., Waltham, Mass.
Wade-American Precision Tool Co., Boston.

**Chucks, Vertical Boring Mill**
Bullard Machine Tool Co., Bridgeport, Conn.
Gisholt Machine Co., Madison, Wis.

**Chucks, Wrenchless**
Thomas Elevator Co., 20 S. Hoyne Ave., Chicago.

**Clamps, Machinists'**
Armstrong Bros. Tool Co., Chicago.
Hammacher, Schlemmer & Co., N. Y. City.
Reed Mfg. Co., Erie, Penn.
Standard Shop Equipment Co., Philadelphia, Pa.
Starrett Co., L. S., Athol, Mass.
Williams & Co., J. H., 35 Richards St., Brooklyn.

**Cleaners, Metal, Waste, General**
Oakley Chemical Co., 24 Thames St., N. Y. City.

**Clocks, Time**
Calculagraph Co., 30 Church St., N. Y. City.
Gisholt Machine Co., Madison, Wis.
International Time Recording Co., N. Y. C.

**Clutches, Friction**
Bicknell-Thomas Co., Greenfield, Mass.
Brown Co., A. & F., 79 Barclay St., N. Y. City.
Brown Engineering Co., Reading, Penn.
Hilliard Clutch & Mchry. Co., Elmira, N. Y.
Johnson Machine Co., Carlyle, Manchester, Conn.
Link-Belt Co., Chicago, Philadelphia.
Moore & White Co., Phila., Pa.
Osterlein Machine Co., Cincinnati, Ohio.
Transmission Ball Bearing Co., Buffalo, N. Y.

**Coal and Ash Handling Machinery**
Link-Belt Co., Chicago, Philadelphia.
Shepard Electric C. & H. Co., Montour Falls, N. Y.
Whiting Foundry Equipment Co., Harvey, Ill.

**Coal-Storage Systems**
Link-Belt Co., Chicago, Philadelphia.

**Coils, Electrical**
D & W Fuse Co., Providence, R. I.
General Electric Co., Schenectady, N. Y.

**Collars, Shaft or Set**
Royersford Fdry. & Mach. Co., Royersford, Pa.

**Collars, Spacing**
Detroit Stamping Co., 951 W. Fort St., Detroit.
Scully-Jones Co., 649 Railway Exc., Chicago.

**Collets**
Bay State Tap & Die Co., Mansfield, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Modern Tool Co., Erie, Penn.
Rivett Lathe & Grinder Co., Brighton, Boston.
Standard Engineering Wks., Pawtucket, R. I.
Union Twist Drill Co., Athol, Mass.
Whitney Mfg. Hartford, Conn.

**Compounds, Carburizing, Casehardening and Tempering**
Bennett Co., W. R., Elmwood, Conn.
Coats Mach. Tool Co., 108-112 W. 40th St., N.Y.C.
Shore Instrument & Mfg. Co., N. Y.
Steel Treating Equipment Co., Detroit, Mich.

**Compounds, Cleaning**
American Chemical Paint Co., N. Y. City.
Oakley Chemical Co., 24 Thames St., N. Y.

**Compounds, Cutting, Drawing, Drilling, Grinding and Screw Cutting**
Fiske Bros. Refining Co., 24 State St., N. Y.
Oakley Chemical Co., 24 Thames St., N. Y.
Texas Co., 17 Battery Place, N. Y.
White & Bagley Co., Worcester, Mass.

**Compounds, Pipe-Joint**
Smooth-On Mfg., Jersey City, N. J.

**Compressors, Air and Gas**
Black & Decker Mfg. Co., Baltimore, Md
Chicago Pneumatic Tool Co., Chicago, Ill.
General Electric Co., Schenectady, N. Y.
Hartford Machine Screw Co., Hartford, Conn.
Ingersoll-Rand Co., 11 Broadway, N. Y. City.
Stratton & Bragg Co., Petersburg, Va.
Taylor Instrument Co.'s, Rochester, N. Y.
Worthington Pump & Mchy. Corp., N. Y. C.

**Conduits, Interior**
General Electric Co., Schenectady, N. Y.

**Cones, Friction**
Evans Fric. Cone Co., Newton Highlands, Mass

**Connecting-Rods and Straps**
Camden Forge Co., Camden, N. J.
Standard Gauge Steel Co., Beaver Falls, Penn.

**Connectors, Solderless**
Holtzer-Cabot Electric Co., Boston.

**Contract Work**
Aetna Foundry & Mach. Co., Warren, Ohio.
Allen, R. A., 1650 E. 66 St., Cleveland.
Atlantic Mfg. Co., Milford, Conn.
Becker Milling Mach. Co., Hyde Park, Mass.
Berggren & Pearson Machine Co., N. Y. City.
Bicknell-Thomas Co., Greenfield, Mass.
Blair Tool & Mch. Wks., 521 Greenwich St., N. Y
Boston Scale & Machine Co., Boston, Mass.
Brady Foundry Co., Jas. A., Chicago.
Brock, Jr., Tool & Mfg. Wks., Arthur, Phila.
Brown & Sharpe Mfg. Co., Providence, R. I.
Budd & Ranney Engineering Co., Columbus, O.
Emery, A. H., Glenbrook, Conn.
Buffalo Pitts Co., Buffalo, N. Y.
Columbus Die Tool & Mach. Co., Columbus, O
Corbin Screw Corp., New Britain, Conn.
Cotton, Inc., H. W., Woolworth Bldg., N. Y. City
Cowdrey Mach. Wks., C. H., Fitchburg, Mass.
C. W. Engineering Co., 131 Nagle Ave., N. Y. C
Budd-Ranney Engineering Co., Columbus, O.
Federal Products Corp., Providence, R. I.
Garvin Mach. Co., Spring & Varick St., N. Y. C.
Gem City Machine Co., Dayton, Ohio.
General Machine Wks., York, Pa.
Grant Mfg. & Machine Co., Bridgeport, Conn.
Hartford Mach. Screw Co., Hartford, Conn.
Hartford Special Mchy. Co., Hartford, Conn.
Hermance Mach. Co., Williamsport, Penn.
Hooth & Stewart, Kalamazoo, Mich.
Humphrey Die & Tool Corp., N. Y. City.
Krasberg Engineering & Mfg. Corp., Chicago, Ill.
Lincoln Machine Co., Pawtucket, R. I.
Marf Machine Co., 17 Vandewater St., N. Y. C.
Marvin & Casler Co., Canastota, N. Y.
Marvin Mfg. Co., W. B., Urbana, Ohio.
Maute & Sons, J., Buffalo, N. Y.
Mehl Machine Tool & Die Co., Rochelle, N. J.
Meisel Press Mfg. Co., 946 Dor. Ave., Boston.
Middletown Fire A. & S. Co., Middletown, Conn.
Modern Mach. & Pattern Co., Terre Haute, Ind
Modern Tool Die & Mach. Co., Columbus, Ohio.
Moody Tool Wks., Chas. J., Elgin, Ill.
Moore & Co., Chicago, Ill.
Nelson Tool & Machine Co., Newark, N. J.
New Britain Machine Co., New Britain, Conn.
Newton Machine Tools Works, Philadelphia, Pa.
Nicholson & Co., W. H., Wilkes-Barre, Pa.
Parker Mach. Co., 221 High St., Boston.
Porter-Cable Machine Co., Syracuse, N. Y.
Potter Tool & Mach. Wks., 79 E. 130th St., N. Y.
Premier Mach. Tool Wks., Albany, N. Y.
Reid Brothers Co., Beverly, Mass.
Reynolds Machine Co., Massillon, Ohio
Rogers Machine Tool Co., Alfred, N. Y.
Root Co., C. J., Bristol, Conn.
Rowbottom Machine Co., Waterbury, Conn
Service Engineering Co., 25 Church St., N. Y. C.
Sheffield Mach. & Tool Co., Dayton, Ohio.
Shepherd Engineering Co., Williamsport, Penn.
Slocum, Avram & Slocum Lab., Newark, N. J.
Sloan & Chace Mfg. Co., Newark, N. J.
Steel Products Engineering Co., Springfield, O.
Stevens-Duryea Co., Chicopee, Mass.
Stratton & Bragg Co., Petersburg, Va.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Taylor Machine Co., Cleveland, O.
Terkelsen & Wennberg, Boston, Mass.
Union Mfg. Co., Union Hill, N. J.
Wade-American Precision Tool Co., Boston.
Weber & Scher Mfg. Co., Newark, N. J.
West & Dodge Co., Boston, Mass.
Western Machine Tool Wks., Holland, Mich.
Whiting & Comstock, Hartford, Conn.
Zumbach Machine Co., 134 W. 54th St., N. Y. C.

**Controllers and Starters, Electric**
Crocker-Wheeler Co., Ampere, N. J.
General Electric Co., Schenectady, N. Y.
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.

**Converters**
General Electric Co., Schenectady, N. Y.

**Conveyors and Elevators (See Elevators)**

**Cotter Pins**
Standard Tool Co., Cleveland, Ohio.

**Counterbores**
Advance Tool Co., Cincinnati, Ohio.
Cleveland Twist Drill Co., Cleveland ,Ohio.
Detroit Twist Drill Co., 644 Fort St., Detroit.
Hall Mfg. Co., Abington, Mass.
Pratt & Whitney Co., Hartford, Conn.
Slocomb Co., J. T., Providence.

**Countershafts**
Brown & Sharpe Mfg. Co., Providence, R. I.
Diamond Machine Co., Providence.
Evans Fric. Cone Co., Newton Highlands, Mass
Garvin Mach. Co., Spring & Varick Sts., N. Y. C.
Norton Co., Worcester, Mass.

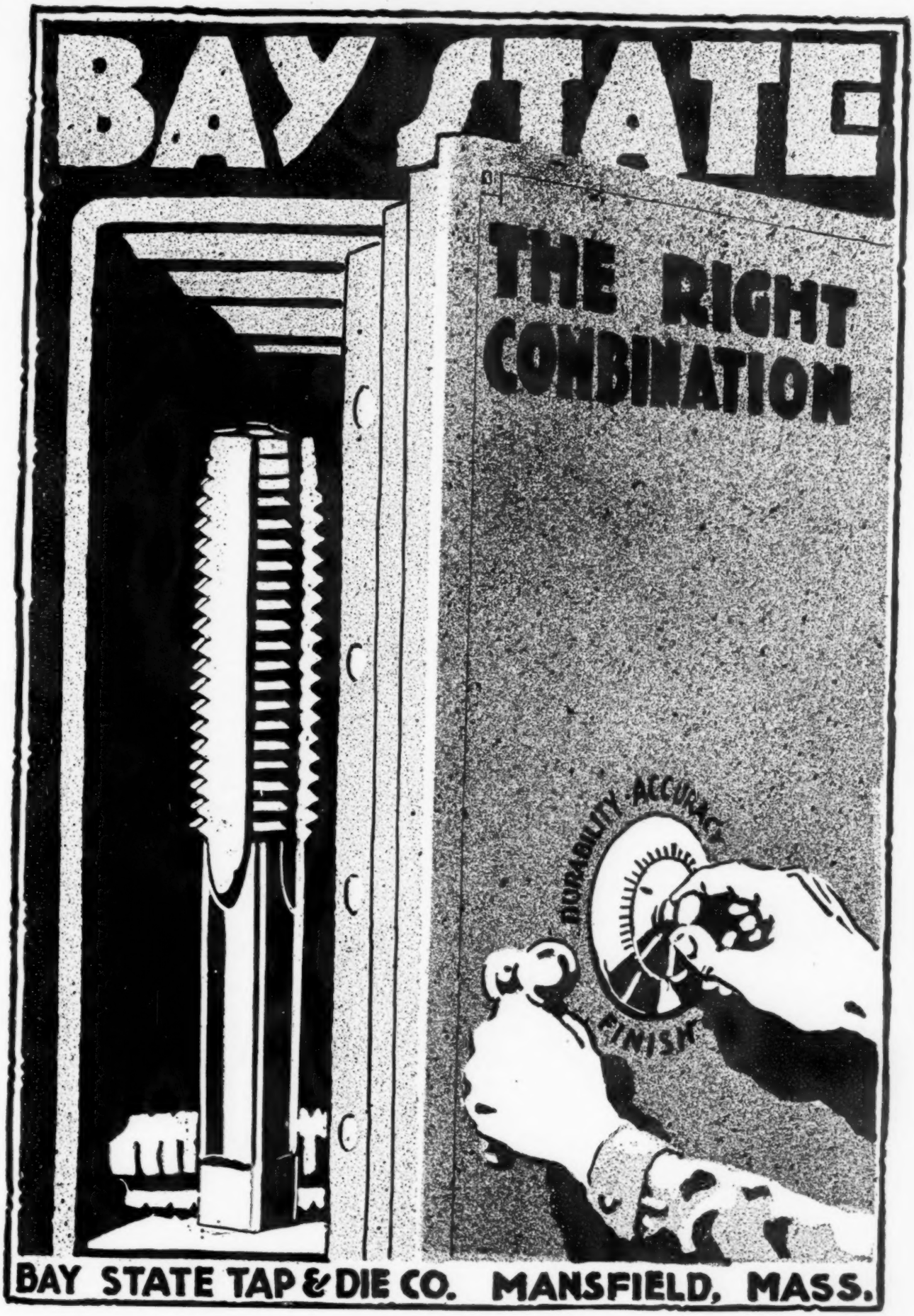
**Countersinks**
Brewster & Co., Wm., 30 Church St., N. Y. City
Clark Equipment Co., Buchanan, Mich.
Gale-Sawyer Co., 33 Wormwood St., Boston.
Greenfield Tap & Die Corp., Greenfield, Mass.
Lincoln Twist Drill Co., Taunton, Mass.

**Counters, Revolution**
Bristol Co., Waterbury, Conn.
Brown Instrument Co., Philadelphia, Pa.
Veeder Mfg. Co., Hartford, Conn.

**Counting Machines**
Brown Instrument Co., Philadelphia, Pa.
Veeder Mfg. Co., Hartford, Conn.

**Counting and Printing Wheels**
Doehler Die Casting Co., Brooklyn, N. Y.
Franklin Mfg. Co., Syracuse, N. Y.

**Couplings, Flexible**
Karge-Baker Corp., Phoenix, N. Y.
Smith and Serrell, 138 Cedar St., N. Y. City.


BAY STATE
THE RIGHT COMBINATION
DURABILITY-ACCURACY
FINISH
BAY STATE TAP & DIE CO. MANSFIELD, MASS.

**Couplings, Rigid**
Smith & Serrell, 138 Cedar St., New York City

**Couplings, Shaft**
Almond Mfg. Co., T. R., Ashburnham, Mass.
Carnegie Steel Co., Pittsburgh, Pa.
Dexter Co., I. I., 27 Walker St., N. Y. C.
Johnson Machine Co., Carlyle, Manchester, Conn.
Karge-Baker Corp., Phoenix, N. Y.
Nicholson & Co., W. H., Wilkes-Barre, Penn.
Royersford Fdry. & Mach. Co., Royersford, Pa.
Smith and Serrell, 138 Cedar St., N. Y. City.
Standard Gauge Steel Co., Beaver Falls, Penn.

**Cranes, Electric**
Euclid Crane & Hoist Co., Euclid, Ohio.
Link-Belt Co., Chicago, Philadelphia.
Toledo Bridge & Crane Co., Toledo, O.
Whiting Foundry Equipment Co., Harvey, Ill.

**Cranes, Hand (See Hoists)**

**Cranes, Locomotive**
Link-Belt Co., Chicago, Philadelphia.
Yale & Towne Mfg. Co., 9 E. 40th St., N. Y.

**Cranes, Traveling**
Canton Foundry & Machine Co., Canton, Ohio.
Case Crane & Engineering Co., Columbus, Ohio.
Chesapeake Iron Wks., Baltimore, Md.
Chisholm-Moore Mfg. Co., Cleveland, Ohio.
Euclid Crane & Hoist Co., Euclid, Ohio.
Harrington, Son & Co., Edwin, Philadelphia, Pa.
Link-Belt Co., Chicago, Philadelphia.
Niles-Bement-Pond Co., 111 Broadway, N. Y. C.
Northern Engineering Wks., Detroit, Mich.
Pawling & Harnischfeger Co., Milwaukee, Wis.
Shepard Electric C. & H. Co., Montour Falls, N. Y.
Toledo Bridge & Crane Co., Toledo, Ohio.
Whiting Foundry Equipment Co., Harvey, Ill.
Yale & Towne Mfg. Co., 9 E. 40th St., N. Y. C.

**Crank Pin Turning Machines**
Niles-Bement-Pond Co., 111 Broadway, N. Y. C.
Underwood Corp., H. B., Philadelphia, Penn.

**Cupolas and Ladles**
Paxson Co., J. W., Philadelphia, Penn.
Whiting Foundry Equipment Co., Harvey, Ill.

**Cutters, Fine**
Clark Equipment Co., Buchanan, Mich.

**Cutters, Gear**
Barber-Colman Co., Rockford, Ill.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cleveland Milling Machine Co., Cleveland, Ohio.
Goddard Tool Co., Chicago, Ill.
Standard Tool Co., Cleveland, Ohio.
Union Twist Drill Co., Athol, Mass.

**Cutters, Milling**
Advance Tool Co., Cincinnati, Ohio.
Arnold Co., H. H., Rockland, Mass.
Barber-Colman Co., Rockford, Ill.
Becker Milling Machine Co., Hyde Park, Mass.
Bilton Machine Tool Co., Bridgeport, Conn.
Brewster & Co., Wm., 30 Church St., N. Y. City
Brown & Sharpe Mfg. Co., Providence, R. I.
Cleveland Milling Machine Co., Cleveland, Ohio.
Cowles Tool Co., Cleveland, Ohio.
Detroit Reamer & Tool Co., Detroit, Mich.
Detroit Twist Drill Co., 644 Fort St., Detroit.
Gale-Sawyer Co., 33 Wormwood St., Boston.
Geometric Tool Co., New Haven, Conn.
Goddard Tool Co., Chicago, Ill.
Gorham Tool Co., Globe Bldg., Detroit
Hall Mfg. Co., Abington, Mass.
Hanscom Cutter Works, Hyde Park, Boston.
Ingersoll Milling Mach. Co., Rockford, Ill.
Krasberg Eng. & Mfg. Corp., Chicago, Ill.
Lincoln Twist Drill Co., The, Taunton, Mass
Michigan Tool Co., Detroit, Mich.
Moody Tool Wks., Chas. J., Elgin, Ill.
National Tool Co., Cleveland, Ohio.
Pratt & Whitney Co., Hartford, Conn.
Reliance Steel & Tool Co., N. Y. City.
Standard Tool Co., Cleveland, Ohio.
Union Twist Drill Co., Athol, Mass.
Whitney Mfg. Co., Hartford, Conn.

**Cutters, Thread**
Rivett Lathe & Grinder Co., Brighton, Boston.
Universal Machine Co., Bowling Green, Ohio.

**Cutting-Off Machines**
Armstrong-Blum Mfg. Co., Chicago, Ill.
Armstrong Bros. Tool Co., Chicago, Ill.
Atkins & Co., E. C., Indianapolis, Ind.
Automatic Machine Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence, R. I.
Coats Mach. Tool Co., 108-112 W. 40th St., N.Y.C.
Cochrane-Bly Co., Rochester, N. Y.
Curtis & Curtis Co., Bridgeport, Conn.
Davis Machine Tool Co., Rochester, N. Y.
Earle Gear & Machine Co., Philadelphia, Penn.
Garvin Mach. Co., Spring & Varick St., N. Y. C.
Gorton Mach. Co., Geo., Racine, Wis.
Greenfield Tap & Die Corp., Machy. Division, Greenfield, Mass.
Hurlbut, Rogers Mchy. Co., South Sudbury, Mass.
Newton Mach. Tool Works, Philadelphia, Penn.
Peter Bros. Mfg. Co., Algonquin, Ill.
Vandyck Churchill Co., 93 Liberty St., N. Y. C.

**Cutting-Off Machines, Pipe (See Pipe-Cutting and Threading Machines)**

**Cutting-Off Tools**
Aetna Machinery Corp., Newark, N. J.
Armstrong Bros. Tool Co., Chicago, Ill.
Parker Machine Co., 221 High St., Boston
Pratt & Whitney Co., Hartford, Conn.
Union Tool Co., Orange, Mass.
Western Tool & Mfg. Co., Springfield, Ohio.

**Cutting Oil Filters (See Oil Filtering Systems)**

**Cutting, Oxy-Acetylene**
Davis-Bournonville Co., Jersey City, N. J.
Milburn Co., Alexander, Baltimore, Md.
Oxweld Acetylene Co., Chicago, Ill.

**Cut-Outs, Electrical**
D & W Fuse Co., Providence, R. I.
General Electric Co., Schenectady, N. Y.
Holtzer-Cabot Electric Co., Boston.
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.

**Dealers, Machinery (See Searchlight Section)**
Aetna Machinery Corp., Newark, N. J.
American Machinery Exchange, N. Y. City.
Badger-Packard Machinery Co., Milwaukee.
Baird Machine Co., W. J., Detroit, Mich.
Barbour, Love & Woodward, N. Y. City.
Bath & Co., Cyril J., Cleveland, Ohio.
Bennett Mchy. Co., G. L., 30 Church St., N. Y. C.
Bertolette Machine Tool Co., Jersey City, N. J.
Broadway Machinery Co., Cincinnati, Ohio.
Brownell Machry. Co., Providence, R. I.
Calumet Iron & Metal Co., Chicago, Ill.
Dale-Brewster Machinery Co., Chicago, Ill.
Day Machinery Co., Buffalo, N. Y.
Bennett, George, 237 Centre St., N. Y. C.
Du Pont Chemical Co., Wilmington, Del.
Eastern Machinery Co., Cincinnati, Ohio.
Factory & Mill Supply Co., Boston, Mass.
Fales Machinery Co., C. E., Detroit.
Federal Machinery Sales Co., Chicago, Ill.
Garvin Machine Co., Spring & Varick St., N.Y.C.
Geib & Co., J., 201 Center St., N. Y. C.
Graves Mchy. Exchange, 50 Church St., N. Y. C.
Green Rail & Supply Co., L. A., Pittsburgh.
Harris Bros. Co., 35th and Iron St., Chicago, Ill.
Hill, Clarke & Co., of Chicago, Chicago, Ill.
Hill, Clarke & Co., 156 Oliver St., Boston, Mass.
Ideal Machinery Co., Plainsville, Conn.
Industrial Machy. Corp., Jersey City, N. J.
Kinsey Co., E. A., Cincinnati, Ohio.
Lamberg & Co., A., 241 Centre St., N. Y. C.
Lynd-Farquhar Co., 419 Atlantic Ave., Boston
McDonough Mfg. Co., Eau Claire, Wis.
McMullen Mchy. Co., Grand Rapids, Mich.
Marshall & Huschart Mchry. Co., Chicago, Ill.
Modern Machinery Exchange, N. Y. City.
Morey & Co., 50 Church St., N. Y. City.
Morris Mchy Co., 93 Chestnut St., Newark, N. J.
Morton Machy. Co., 139 N. 3 St., Phila.
Motch & Merryweather Mchy. Co., Cleveland.
New York Mchy. Exch., 50 Church St., N. Y. C.
Niles-Bement-Pond Co., 115 Bway., N. Y. C.
Osborne & Sexton Mchy. Co., Columbus, Ohio.
Prentiss & Co., Henry, Singer Bldg., N. Y. City.
Richards, Anson W, 802 Singer Bldg., N. Y. C.
Russell Machine Co., Pittsburgh, Pa.
Schoonmaker & Sons, A. G., New York City.
Simmons Mach. Co., 149 Broadway, N. Y. City.
Standard Machine Tool Co., Columbus, Ohio.
Stickley Mach. Co., E. B., Goebel Bldg., Detroit.
Stocker-Rumely-Wachs Co., Chicago.
Strong, Carlisle & Hammond Co., Cleveland, O.
Toomey, Frank, 127 N. 3rd St., Phila., Penn.
Vandyck, Churchill Co., 93 Liberty St., N. Y. C.
Vonnegut Machinery Co., Indianapolis, Ind.
Walsh Machinery Co., M. J., Milwaukee, Wis.
Wayne Machinery Co., Fort Wayne, Ind.
Westinghouse Elec. & Mfg. Co., E. Pittsburgh.
Wickes Machinery Co., Jersey City, N. J.
Winterer, Herman L., Philadelphia
Young, Corley & Dolan, 28 W. Broadway, N. Y. C.
Zelnicker Supply Co., Walter A., St. Louis, Mo.

**Diamond Tools**
Crafts & Co., Arthur A., 125 Summer St., Boston.
Desmond-Stephen Mfg. Co., Urbana, Ohio.
Dickinson, Thomas L., 64 Nassau St., N. Y. City.
Francis & Co., 50 State St., Hartford, Conn.
Wheel Trueing Tool Co., 320 Ford Bldg., Detroit.

**Die Making Machines**
Anderson Die Mach. Co., Bridgeport, Conn.
Boston Tool & Mfg. Co., Boston, Mass.
Cochrane-Bly Co., Rochester, N. Y.
Keller Mech. Engraving Co., Brooklyn, N. Y.

**Die Sinking Machines, Automatic**
Keller Mech. Engraving Co., Brooklyn, N. Y.

**Dies, Forging**
Keller Mech. Engraving Co., Brooklyn, N. Y.

**Dies, Sheet Metal and Sub-Press (See Tool Work)**

**Die, Threading-Opening**
Eastern Mach. Screw Corp., New Haven, Conn.
Errington, F. A., 41 Cortlandt St., N. Y. City.
Federal Products Corp., Providence, R. I.
Geometric Tool Co., New Haven, Conn.
Greenfield Tap & Die Corp., Greenfield, Mass
Ideal Tool & Mfg. Co., Beaver Falls, Pa
Jones & Lamson Mach Co., Springfield, Vt
Landis Mach. Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Murchey Mch. & Tool Co., 64 Porter St., Detroit
National Acme Co., Cleveland, Ohio.
National Mchy. Co., Tiffin, Ohio.
Rickert-Shafer Co., Erie, Pa.
Warner & Swasey Co., Cleveland, Ohio.

**Dividing Heads**
Whiting & Comstock, Hartford, Conn.

**Dogs, Lathe and Milling Machine**
Armstrong Bros. Tool Co., Chicago, Ill.
Union Tool Co., Orange, Mass.
William & Co., J. H., 35 Richards St., Brooklyn.

**Drafting Boards and Tables**
Spaulding-Moss Co., Boston, Mass.

**Drafting Materials**
Spaulding-Moss Co., Boston, Mass.

**Dressers, Grinding Wheel**
Bay State Stamping Co., Worcester, Mass.
Crafts & Co., Arthur A., 125 Summer St., Boston
Desmond-Stephan Mfg. Co., Urbana, Ohio.
Francis & Co., 50 State St., Hartford, Conn.
Norton Co., Worcester, Mass.
Standard Tool Co., Cleveland, Ohio.

**Drill Holders**
Armstrong Bros. Tool Co., Chicago, Ill.
Union Tool Co., Orange, Mass.

**Drill Rods**
Boker & Co., H., 101 Duane St., N. Y. City.

**Drill Speeders**
Graham Mfg. Co., Providence, R. I.
Turner Machine Co., Danbury, Conn.

**Drilling Machine Heads**
Baush Machine Tool Co., Springfield, Mass.
Hoefer Mfg. Co., Freeport, Ill.
Langelier Mfg. Co., Arlington, Cranston, R. I.
Nelson-Blanck Mfg. Co., Detroit, Mich.
Sellew Machine Tool Co., Pawtucket, R. I.
Stafford Tool Works, Hartford, Conn.

**Drilling Machines, Automatic**
Baush Machine Tool Co., Springfield, Mass.
Baker Bros., Toledo, Ohio.
Bilton Mach. Tool Co., Bridgeport, Conn.
Cincinnati Pulley Machinery Co., Cincinnati, O
Langelier Mfg. Co., Arlington, Cranston, R. I.
National Automatic Tool Co., Richmond, Ind.

**Drilling Machines, Bench**
Ames Co., B. C., Waltham, Mass.
Barnes Co., W. F. & John, Rockford, Ill
Bilton Mach. Tool Co., Bridgeport, Conn.
Burke Machine Tool Co., Conneaut, Ohio.
Cincinnati Pulley Mchy. Co., Cincinnati, Ohio.
Clark Electric Co., Jas., Jr., Louisville, Ky.
Foefer Mfg. Co., Freeport, Ill.
Langelier Mfg. Co., Arlington, Cranston, R. I.
Pratt & Whitney Co., Hartford, Conn.
Sigourney Tool Co., Hartford, Conn.
Silver Mfg. Co., Salem, Ohio.
Sloan & Chace Mfg. Co., Newark, N. J.
Standard Electric Tool Co., Cincinnati, O.
Taylor & Fenn Co., Hartford, Conn.
U. S. Electrical Tool Co., Cincinnati, Ohio.

**Drilling Machines, Electric and Hand**
Black & Decker Mfg. Co., Baltimore, Md.
Chicago Pneumatic Tool Co., Chicago, Ill.
Cincinnati Electrical Tool Co., Cincinnati, Ohio
Clark Electric Co., Jas., Jr., Louisville, Ky.
Independent Pneumatic Tool Co., Chicago, Ill.
Ingersoll-Rand Co., 11 Broadway, N. Y. City
Neil & Smith Electric Tool Co., Cincinnati, Ohio
Silver Mfg. Co., Salem, Ohio.
Standard Electric Tool Co., Cincinnati, O.
U. S. Electrical Tool Co., Cincinnati, Ohio.
Wisconsin Electric Co., Racine, Wis.

**Drilling Machines, Gang**
Baker Bros., Toledo, Ohio.
Barnes Drill Co., 830 Chestnut St., Rockford, Ill.
Bilton Mach. Tool Co., Bridgeport, Conn.
Cincinnati Bickford Tool Co., Cincinnati, Ohio.
Colburn Mach. Tool Co., Franklin, Pa.
Langelier Mfg. Co., Arlington, Cranston, R. I.
Moline Tool Co., Moline, Ill.
Silver Mfg. Co., Salem, Ohio.
Sipp Mach. Co., Erie R. R. Ave., Paterson, N. J.
Taylor & Fenn Co., Hartford, Conn.

**Drilling Machines, Heavy Duty**
Baker Bros., Toledo, Ohio.
Betts Mach. Co., Rochester, N. Y.
Colburn Mach. Tool Co., Franklin, Pa.
Hoefer Mfg. Co., Freeport, Ill.
Niles-Bement-Pond Co., 111 Broadway, N. Y. C.

**Drilling Machines, Horizontal (See Boring, Drilling and Milling Machines, Horizontal)**

**Drilling Machines, Multiple Spindle**
Baush Machine Tool Co., Springfield, Mass.
Fox Mach. Co., Jackson, Mich.
Harrington, Son & Co., Edwin, Philadelphia, Pa.
Langelier Mfg. Co., Arlington, Cranston, R. I.
National Automatic Tool Co., Richmond, Ind.
Newton Mach. Tool Works, Philadelphia, Penn.
Sellers & Co., Wm., Philadelphia, Pa.
Turner Machine Co., Danbury, Conn.

**Drilling Machines, Pneumatic**
Cleveland Pneumatic Tool Co., Cleveland, Ohio
Independent Pneumatic Tool Co., Chicago, Ill.
Ingersoll-Rand Co., 11 Broadway, N. Y. City

**Drilling Machines, Portable**
Cincinnati Electrical Tool Co., Cincinnati, Ohio.
Independent Pneumatic Tool Co., Chicago, Ill.
Newton Mach. Tool Works, Philadelphia, Pa.
U. S. Electrical Tool Co., Cincinnati, Ohio.
Wisconsin Electric Co., Racine, Wis.

**Drilling Machines, Radial**
American Tool Works Co., Cincinnati, Ohio.
Baush Machine Tool Co., Springfield, Mass.
Betts Machine Co., Rochester, N. Y.
Carlton Mach. Tool Co., Cincinnati, Ohio.
Cincinnati Bickford Tool Co., Cincinnati, Ohio.
Dreses Mach. Tool Co., Cincinnati, Ohio.
Fosdick Mach. Tool Co., Cincinnati, Ohio.
Hammond Mfg. Co., Cleveland, Ohio.
Harrington, Son & Co., Edwin, Philadelphia, Pa
Lynd-Farquhar Co., Boston, Mass.
Morris Mach. Tool Co., Cincinnati, Ohio.
Mueller Mach. Tool Co., Cincinnati, Ohio.
Newton Mach. Tool Wks., Philadelphia, Pa.
Niles-Bement-Pond Co., 11 Broadway, N. Y. City
Reed-Prentice Co., Worcester, Mass.
Sellers & Co., Wm., Philadelphia, Pa.
Strong, Carlisle & Hammond Co., Cleveland, O.

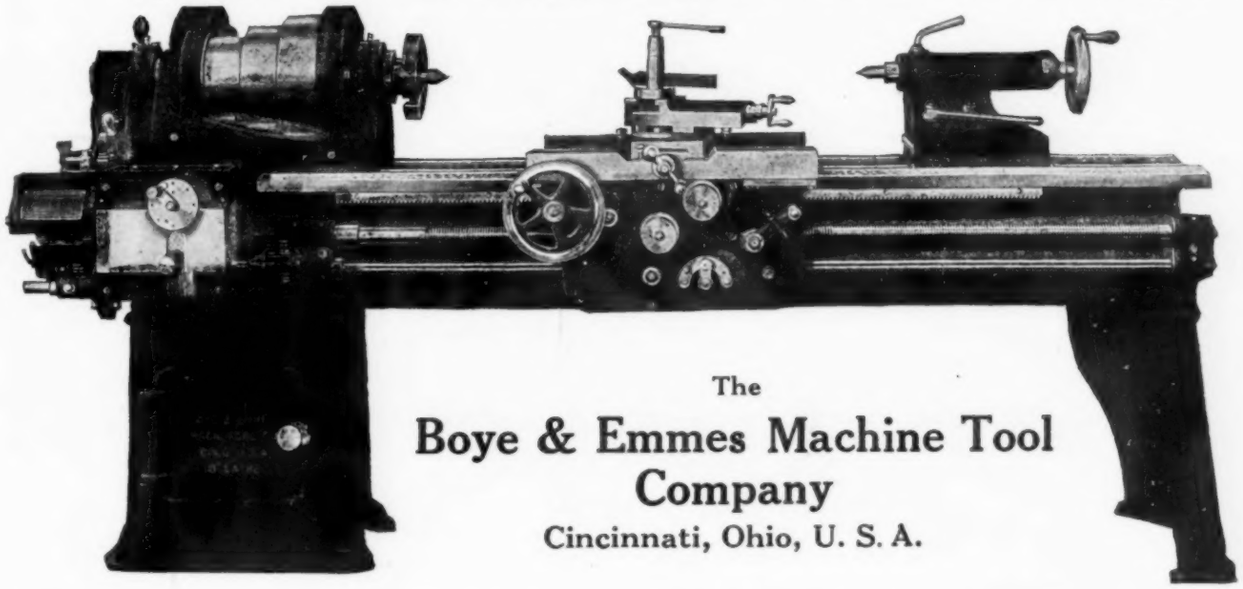
**Drilling Machines, Sensitive**
Bilton Mach. Tool Co., Bridgeport, Conn.
Cincinnati Pulley Machy. Co., Cincinnati, Ohio.
Coats Mach. Tool Co., 108-112 W. 40th St., N.Y.C.
Edlund Machry. Co., Inc., Cortland, N. Y.
Henry & Wright Mfg. Co., Hartford, Conn.
Knight Machy. Co., W. B., St. Louis, Mo.
Langelier Mfg. Co., Arlington, Cranston, R. I.
Leland-Gifford Co., Worcester, Mass.
Reed-Prentice Co., Worcester, Mass.
Royersford Fdry. & Mach. Co., Royersford, Penn
Sigourney Tool Co., Hartford, Conn.
Sipp Mach. Co., Erie R. R. Ave., Paterson, N. J
Taylor & Fenn Co., Hartford, Conn.
Wisconsin Electric Co., Racine, Wis.

**Drilling Machines, Turret**
National Automatic Tool Co., Richmond, Ind.
Turner Machine Co., Danbury, Conn.

**Drilling Machines, Vertical**
Baker Bros., Toledo, Ohio.
Barnes Co., W. F. & John, Rockford, Ill.
Barnes Drill Co., Inc., Rockford, Ill.
Baush Machine Tool Co., Springfield, Mass.
Betts Machine Co., Rochester, N. Y.
Cincinnati Bickford Tool Co., Cincinnati, Ohio
Cincinnati Pulley Machy. Co., Cincinnati, Ohio
Coats Mach. Tool Co., 108-112 W. 40th St., N.Y.C.
Colburn Mach. Tool Co., Franklin, Pa.
Davis Machine Tool Co., Rochester, N. Y.
Harrington, Son & Co., Edwin, Philadelphia, Pa
Hoefer Mfg. Co., Freeport, Ill.
Knight Machy. Co., W. B., St. Louis, Mo.
Langelier Mfg. Co., Arlington-Cranston, R. I.
Leland-Gifford Co., Worcester, Mass.

# BOYE & EMMES LATHES

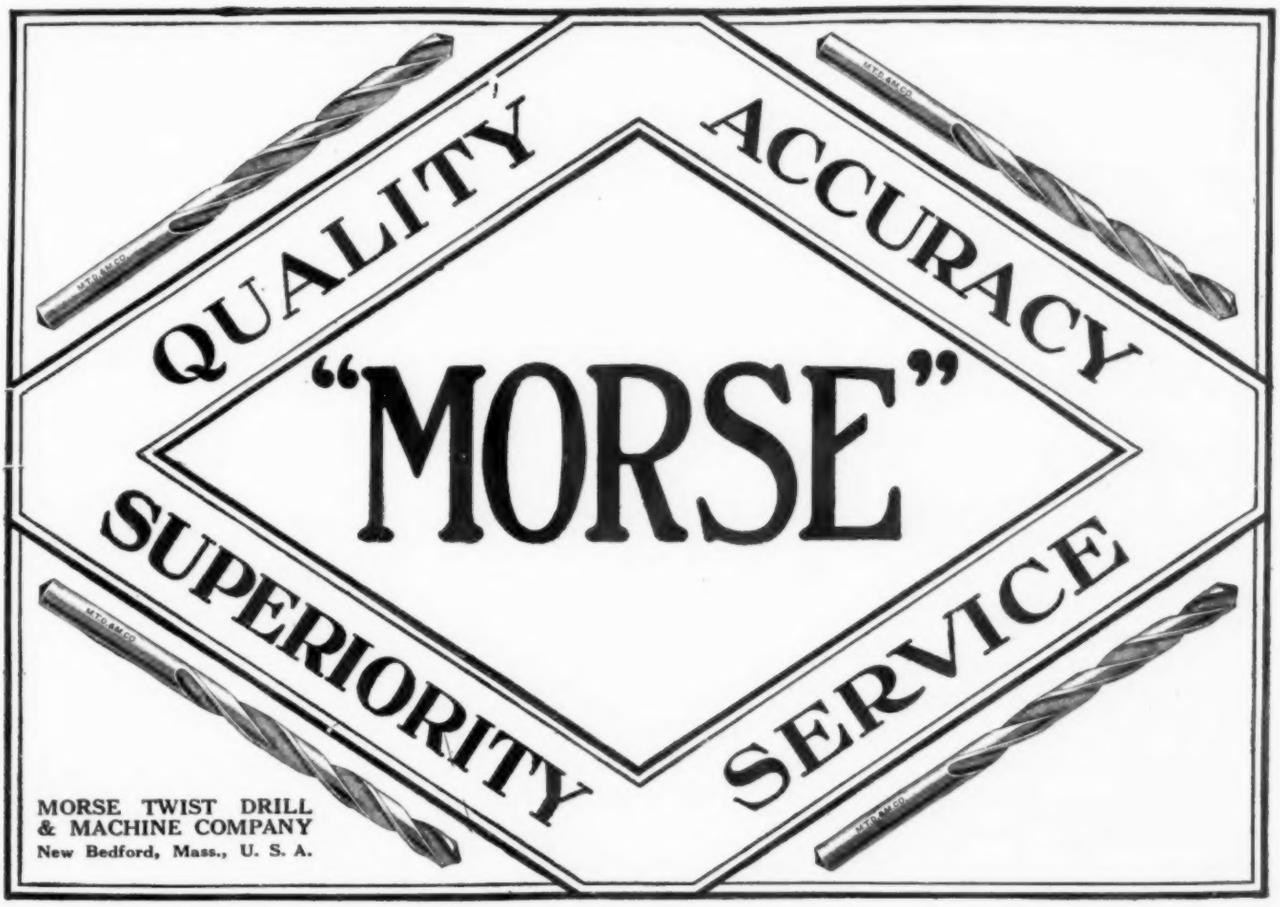
**This is the 18-in. Instantaneous Change Gear Engine Lathe—Double Back Geared—Double Plate Apron**



The

**Boye & Emmes Machine Tool Company**

Cincinnati, Ohio, U. S. A.




MORSE TWIST DRILL & MACHINE COMPANY
New Bedford, Mass., U. S. A.

Niles-Bement-Pond Co., 111 Bway, N. Y. City.
Reed-Prentice Co., Worcester, Mass.
**Rockford Lathe & Drill Co., Rockford, Ill.**
Royersford Fdry. & Mach. Co., Royersford, Pa.
Sigourney Tool Co., Hartford, Conn.
Silver Mfg. Co., Salem, Ohio.
Taylor & Fenn Co., Hartford, Conn.
Turner Machine Co., Danbury, Conn.

**Drills, Center**
Cleveland Twist Drill Co., Cleveland, Ohio.
Detroit Twist Drill Co., 644 Fort St., Detroit.
Lincoln Twist Drill Co., Taunton, Mass.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Pratt & Whitney Co., Hartford, Conn.
Reliance Steel & Tool Co., 24 Murray St., N. Y.
Slocomb Co., J. T., Providence, R. I.
Standard Tool Co., Cleveland, Ohio.
Union Twist Drill Co., Athol, Mass.

**Drills, Ratchet**
Armstrong Bros. Tool Co., Chicago, Ill.
Cleveland Twist Drill Co., Cleveland, Ohio.
Detroit Twist Drill Co., 644 Fort St., Detroit.
Lincoln Twist Drill Co., Taunton, Mass.
Reliance Steel & Tool Co., 24 Murray St., N. Y.
Rich Tool Co., Railway Exchange, Chicago.
Union Twist Drill Co., Althol, Mass.

**Drills, Twist and Flat**
Buckeye Twist Drill Co., Alliance, Ohio.
Clark Equipment Co., Buchanan, Mich.
Cleveland Twist Drill Co., Cleveland, Ohio.
Detroit Twist Drill Co., 644 Fort St., Detroit.
Hammacher, Schlemmer & Co., N. Y. City.
Latrobe Tool Co., Latrobe, Pa.
Lincoln Twist Drill Co., The, Taunton, Mass.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Pratt & Whitney Co., Hartford, Conn.
Rich Tool Co., Railway Exchange, Chicago.
Standard Tool Co., Cleveland, Ohio.
Union Twist Drill Co., Athol, Mass.

**Dust Handling Equipment**
Pangborn Corporation, Hagerstown, Md.

**Dynamometers**
General Electric Co., Schenectady, N. Y.
Holtzer-Cabot Electric Co., Boston.

**Electrical Instruments**
Brown Instrument Co., Philadelphia, Pa.
General Electric Co., Schenectady, N. Y.
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.

**Electrical Supplies**
D & W Fuse Co., Providence, R. I.
General Electric Co., Schenectady, N. Y.
Holtzer-Cabot Electric Co., Boston.
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.
Weston Elec. Instrument Co., Newark, N. J.

**Elevating Trucks (See Trucks)**

**Elevators and Conveyors**
Albro-Clem Elevator Co. Philadelphia, Pa.
Caldwell & Son Co., Chicago, Ill.
Link-Belt Co., Chicago, Philadelphia.
Pangborn Corporation, Hagerstown, Md.

**Emery Wheels (See Grinding Wheels)**

**Enamels, Machinery**
Hilo Varnish Corp., 8 Gerry St., Bklyn., N. Y.

**Engineers, Mechanical**
Hartford Special Machy. Co., Hartford, Conn.
Hooth & Stewart, Kalamazoo, Mich.
Krasberg Eng. & Mfg. Corp., Chicago, Ill.
Service Engineering Co., N. Y. City.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

**Engraving Machinery**
Engravers & Printers Mch. Co., Sag Harbor, N. Y.
Federal Products Corp., Providence, R. I.
Gorton Mach. Co., Geo., Rachine, Wis.
Keller Mech. Engraving Co., Brooklyn, N. Y.

**Expanders, Tube**
Watson-Stillman Co., 42 Church St., N. Y. City.

**Eyeglass, Safety (See Goggles, Safety)**

**Eye Protectors**
Willson & Co., T. A., Reading, Pa.

**Fans, Electric**
Crocker-Wheeler Co., Ampere, N. J.
General Electric Co., Schenectady, N. Y.
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa

**Fans, Exhaust**
General Electric Co., Scaenectady, N. Y.
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa

**Fans, Ventilating**
General Electric Co., Schenectady, N. Y.

**Fibre**
American Vulcanized Fibre Co., Wilmington, Del.

**File Handles**
Grover File Co., Nashua, N. H.
Nicholson File Co., Providence, R. I.

**Files and Rasps**
American Swiss File & Tool Co., N. Y. C.
Barnett Co., G. & H., Philadelphia, Pa.
Delta File Works, Philadelphia, Pa.
Grover File Co., Nashua, N. H.
Hammacher, Schlemmer & Co., N. Y. City.
Nicholson File Co., Providence, R. I.
Simonds Mfg. Co., Fitchburg, Mass.
Vixen Tool Co., Newark, N. J.

**Filing Machines**
Ames Co., B. C., Waltham, Mass.
Anderson Die Mach. Co., Bridgeport, Conn.
Boston Tool & Mfg. Co., Boston, Mass.
Cochrane-Bly Co., Rochester, N. Y.
Noble & Westbrook Mfg. Co., Hartford, Conn.
**Filler, Iron (See Cement, Iron)**

**Fittings, Hydraulic**
Elmes Engineering Works, Chas. F., Chicago, Ill.
Watson-Stillman Co., 42 Church St., N. Y. City.

**Flexible Shafts**
Chicago Flexible Shaft Co., Chicago, Ill.
Errington, F. A., 41 Cortland St., N. Y. City.
Gem Mfg. Co., Pittsburgh, Pa.

**Flooring, Wood Block**
Republic Creosoting Co., Indianapolis, Ind.

**Forging Machinery**
Acme Machinery Co., Cleveland, Ohio.
Bradley & Son, C. C., Syracuse, N. Y.
National Machy. Co., Tiffin, Ohio.

**Forgings, Drop**
Bearings Co. of America, Lancaster, Pa.
Johnston & Jennings Co., Cleveland, Ohio.
Moore Drop Forging Co., Springfield, Mass.
Steel Forgings Co., Cincinnati, Ohio.
Universal Machine Co., Bowling Green, Ohio.
Williams & Co., J. H., 35 Richards St., Brooklyn

**Forgings, Hammer**
Aborn Steel Co., Inc., 22 Clarke St., N. Y. City.
Camden Forge Co., Camden, N. J.
Halcomb Steel Co., Syracuse, N. Y. City.
Johnston & Jennings Co., Cleveland, Ohio.
Steel Forgings Co., Cincinnati, Ohio.
Williams & Co., J. H., Brooklyn, N. Y.

**Foundry Equipment**
Anderson Bros. Mfg. Co., Rockford, Ill.
Atkins & Co., E. C., Indianapolis, Ind.
Cleveland Osborne Mfg. Co., Cleveland, Ohio.
Whiting Foundry Equipment Co., Harvey, Ill.

**Foundry Supplies**
Cleveland Osborne Mfg. Co., Cleveland, Ohio.
Paxson Co., J. W., Philadelphia, Pa.

**Furnaces, Heat-Treating, Coal**
American Incandescent Heat Co., Boston.

**Furnaces, Heat-Treating Oil and Gas**
American Incandescent Heat Co., Boston, Mass.
American Gas Furnace Co., 24 John St., N. Y. C.
Baird Pneumatic Tool Co., Kansas City, Mo.
Bennett Co., W. R., Elmwood, Conn.
Brown & Sharpe Mfg. Co., Providence, R. I.
Chicago Flexible Shaft Co., Chicago, Ill.
Eclipse Fuel Engineering Co., Rockford, Ill.
Gilbert & Barker Mfg. Co., Springfield, Mass.
Johnson Gas Appliance Co., Cedar Rapids, Iowa
Strong, Carlisle & Hammond Co., Cleveland, O
Tate, Jones & Co., Pittsburgh, Pa.

**Furnaces and Ovens, Electric**
Brown Instrument Co., Philadelphia, Pa.
Englehard, Charles, 30 Church St., N. Y. City.
General Electric Co., Schenectady, N. Y.

**Furnaces, Tempering and Annealing**
Bennett Co., W. R., Elmwood, Conn.
Brown & Sharpe Mfg. Co., Providence, R. I.
Chicago Flexible Shaft Co., Chicago, Ill.
Eclipse Fuel Engineering Co., Rockford, Ill.
General Electric Co., Schenectady, N. Y.
Gilbert & Barker, Springfield, Mass.
Johnson Gas Appliance Co., Cedar Rapids, Iowa.
Strong, Carlisle & Hammond Co., Cleveland, O.
Tate, Jones & Co., Pittsburgh, Pa.

**Furniture, Machine Shop**
Brown Engineering Co., Reading, Pa.
Lyon Metallic Mfg. Co., Aurora, Ill.
Manufacturing Equipment & Engineering Co., Framington, Mass.
New Britain Mach. Co., New Britain, Conn.
Niles-Bement-Pond Co., 111 Broadway, N. Y. C.

**Gages, Amplifying**
American Gauge Co., Dayton, Ohio

**Gages, Dial**
Ames Co., B. C., Waltham, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Starrett Co., L. S., Athol, Mass.

**Gages, Indicating**
Grove Mfg. Co., Dayton, Ohio.

**Gages, Recording**
Bristol Co., Waterbury, Conn.
Brown Instrument Co., Philadelphia, Pa.
General Electric Co., Schenectady, N. Y.

**Gages, Snap, Thread and Cylindrical**
Brown & Sharpe Mfg. Co., Providence, R. I.
Greenfield Tap and Die Corp., Greenfield, Mass.
Johannson, Inc., C. E., 245 W. 55 St., N. Y. C.
Lowry-Knise Tool Co., Syracuse, N. Y.
West & Dodge Co., Boston, Mass.
Wilton Tool & Mfg. Co., Boston, Mass.

**Gages, Special Measuring (See Tool Work)**

**Gages, Standard**
Advance Tool Co., Cincinnati, Ohio.
Bicknell-Thomas Co., Greenfield, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Coats Mach. Tool Co., 108-112 W. 40th St., N.Y.C.
Greenfield Tap & Die Corp., Greenfield, Mass.
Hartford Special Machy. Co., Hartford, Conn.
Johannson, Inc., C. E., 245 W. 55 St., N. Y. C.
West & Dodge Co., Boston, Mass.
Wilton Tool & Mfg. Co., Boston, Mass.

**Gages, Thread**
Arrow Tool Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cotton, Inc., H. W., Woolworth Bldg., N.Y.City.
Greenfield Tap & Die Corp., Greenfield, Mass.
Sheffield Mach. & Tool Co., Dayton, Ohio.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
West & Dodge Co., Boston, Mass.

**Galvanizing Outfits, Electro**
Cutter & Wood Supply Co., Boston.

**Gas, Compressed**
Davis-Bournonville Co., Jersey City, N. J.
Oxweld Acetylene Co., Chicago, Ill.

**Gaskets**
Graton & Knight Mfg. Co., Worcester, Mass.

**Gear Blanks**
Camden Forge Co., Camden, N. J.
Carnegie Steel Co., Pittsburgh, Pa.
Hartford Machine Screw So., Hartford, Conn.
Joanston & Jennings Co., Cleveland, Ohio.

**Gear Cutting Machines**
Adams Co., 1902 Bridge St., Dubuque, Iowa.
Barber-Colman Co., Rockford, Ill.
Becker Milling Mach. Co., Hyde Park, Mass.
Bilgram Mach. Works, Philadelphia, Pa.
Bilton Mach. Tool Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Gear Cutting Mach. Co., Cincinnati.
Clough, R. M., Meriden, Conn.
Fellows Gear Shaper Co., Springfield, Vt.
Flather Mfg. Co., Nashua, N. H.
Garvin Mach. Co., Spring and Varick St., N. Y. C.
Gleason Works, Rochester, N. Y.
Gould & Eberhardt, Rochester, N. Y.
Harrington, Son & Co., Edwin, Philadelphia, Pa.
Lees-Bradner Co., Cleveland, Ohio.
Machine Products Co., Cleveland, Ohio.
Newark Gear Cutting Mach. Co., Newark, N. J.
Newton Mach. Tool Works, Philadelphia, Pa.
Prentiss & Co., Henry, Singer Bldg., N. Y. City.
Sloan & Chace Mfg. Co., Newark, N. J.
Strong, Carlisle & Hammond Co., Cleveland, O.
Van Dorn & Dutton Co., Cleveland, Ohio
Waltham Mach. Works, Waltham, Mass.
Whiting & Comstock, Hartford, Conn.
Whiton Mach. Co., D. E., New London, Conn.

**Gear Tempering Machinery**
Gleason Works, Rochester, N. Y.

**Gear Testing Machinery**
Adams Co., 1902 Bridge St., Dubuque, Iowa.
Brown & Sharpe Mfg. Co., Providence, R. I.
Gisholt Machine Co., Madison, Wis.
Gleason Works, Rochester, N. Y.
Machine Products Co., Cleveland, Ohio.

**Gear Tooth Rounding Machines**
Ingle Machine Co., Rochester, N. Y.

**Gears, Cast**
Brown & Sharpe Mfg. Co., Providence, R. I.
Brown Co., A. & F., 79 Barclay St., N. Y. City.
Caldwell & Son Co., H. W., Chicago, Ill.
Carpenter Tew Gear Co., Brooklyn, N. Y.
Cleveland Worm & Gear Co., Cleveland, Ohio.
Franklin Mfg. Co., Syracuse, N. Y.
Grant Gear Works, 151 Pearl St., Boston, Mass
Horsburgh & Scott Co., Cleveland, Ohio.
Jones Fdry. & Mach. Co., W. A., Chicago.
Link-Belt Co., Chicago, Philadelphia.
Meisel Press Mfg. Co., Boston, Mass.
Philadelphia Gear Works, Philadelphia, Pa.
Van Dorn & Dutton Co., Cleveland, Ohio.

**Gears, Cut**
Adams Co., 1902 Bridge St., Dubuque, Iowa.
Albaugh-Dover Co., Chicago, Ill.
Albro-Clem Elevator Co., Philadelphia, Pa.
Alling-Lander Co., Sodus, N. Y.
Baush Machine Tool Co., Springfield, Mass.
Bilgram Mach. Works, Philadelphia, Pa.
Boston Gear Wks., Norfolk Downs, Quincy, Mass
Brown & Sharpe Mfg. Co., Providence, R. I.
Brown Co., A. & F., 79 Barclay St., N. Y. City.
Carpenter Tew Gear Co., Brooklyn, N. Y.
Chicago Rawhide Mfg. Co., Chicago, Ill.
Cincinnati Gear Co., Cincinnati, Ohio.
Cleveland Worm & Gear Co., Cleveland, Ohio.
Crofoot Gear Wks., Sta. "A," Cambridge, Mass
Fawcus Machine Co., Pittsburgh, Pa.
Fellows Gear Shaper Co., Springfield, Vt.
Flather Mfg. Co., Nashua, N. H.
Foote Bros. Gear & Mach. Co., Chicago, Ill.
Ganschow Co., Wm., Chicago, Ill.
Garvin Mach. Co., Spring & Varick St., N. Y. C
General Electric Co., Schenectady, N. Y.
Gleason Works, Rochester, N. Y.
Gould & Eberhardt, Newark, N. J.
Grant Gear Works, Inc., 151 Pearl St. Boston.
Holtzer-Cabot Electric Co., Boston.
Horsburgh & Scott Co., Cleveland, Ohio.
Jones Fdry. & Mach. Co., W. A., Chicago.
Link-Belt Co., Chicago, Philadelphia.
Machine Products Co., Cleveland, Ohio.
M-C Mfg. Co., 28 Congress St., Newark, N. J.
Meacham Gear Corp., Syracuse, N. Y.
Meisel Press Mfg. Co., Boston, Mass.
Newark Gear Cutting Mach. Co., Newark, N. J
New Britain Mach. Co., New Britain, Conn.
Philadelphia Gear Works, Philadelphia, Pa.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Taylor Mach. Co., Cleveland, O.
Van Dorn & Dutton Co., Cleveland, Ohio.

**Gears, Herringbone**
Boston Gear Wks., Norfolk Downs, Quincy, Mass
Carpenter Tew Gear Co., Brooklyn, N. Y.
Fawcus Machine Co., Pittsburgh, Pa.
Machine Products Co., Cleveland, Ohio.
Meisel Press Mfg. Co., 346 Dar. Ave., Boston

**Gears, Rawhide (See Gears, Cut)**

**Gears, Worm**
Cleveland Worm Gear Co., Cleveland, Ohio.
Philadelphia Gear Works, Philadelphia, Pa.

**Generators, Electric**
Crocker-Wheeler Co., Ampere, N. J.
General Electric Co., Schenectady, N. Y.
Holtzer-Cabot Electric Co., Boston.
Reliance Electric & Engineering Co., Cleveland.
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.

**Goggles, Safety**
Willson & Co., T. A., Reading, Penn.

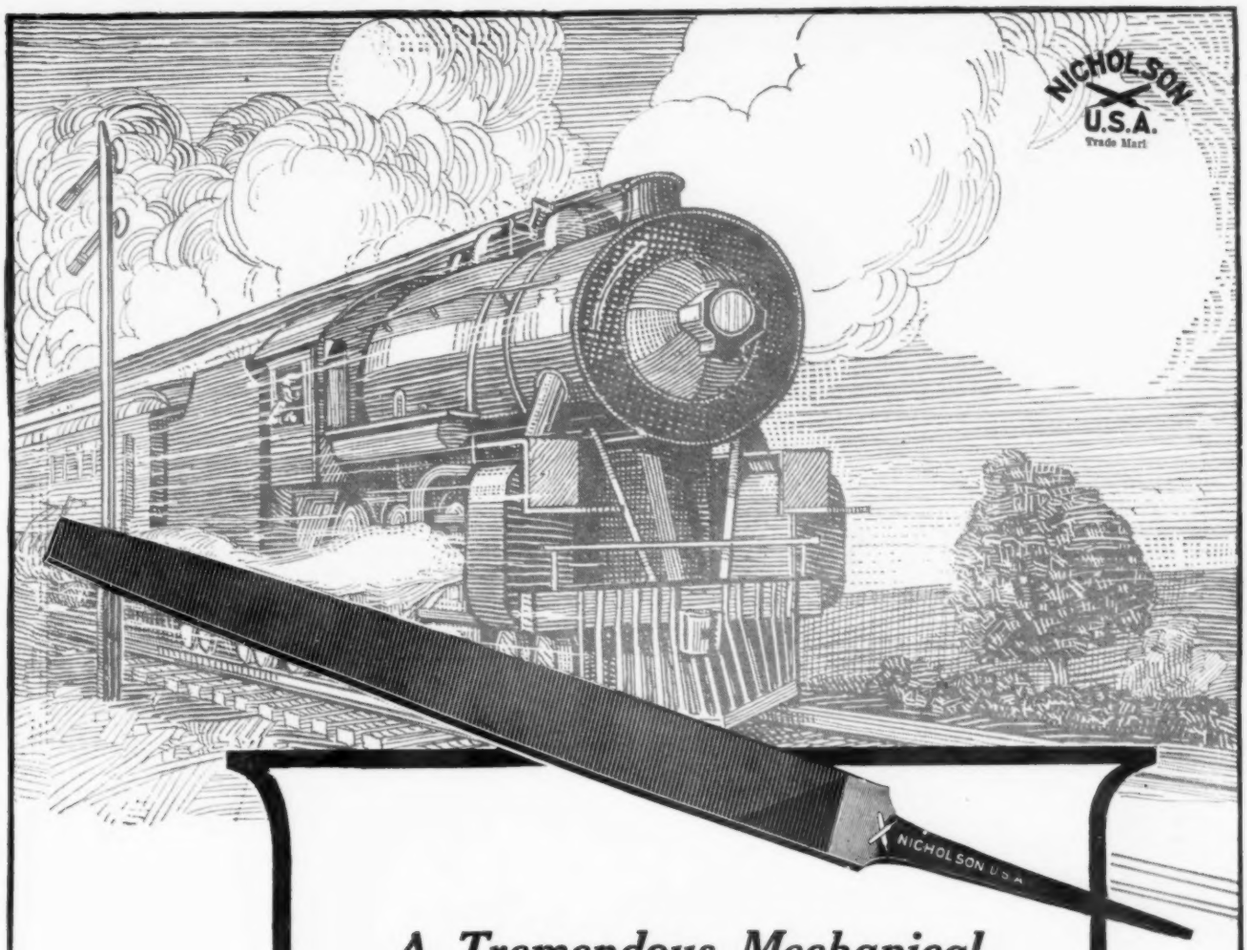
**Grab Buckets**
Link-Belt Co., Chicago, Philadelphia.

**Greases, Lubricating**
Fiske Bros. Refining Co., 24 State St., N. Y. C
Royersford Fdry. & Mach. Co., Royersford, Pa.
Texas Co 17 BBattery Place, N. Y.
White & Bagley Co., Worcester, Mass.

**Grinding Machines, Ball Bearing Race (See Grinding Machines, Radial)**

**Grinding Machines, Abrasive Belt**
Blevney Machine Co., Greenfield, Mass.

**Grinding Machines, Bench**
Athol Machine Co., Athol, Mass.
Blount Co., J. G., Woodland St., Everett, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Clark Electric Co., Jas., Jr., Louisville, Ky.
Diamond Machine Co., Providence, R. I.
Forbes & Myers, 170 Union St., Worcester, Mass.
Gale-Sawyer Co., 33 Wormwood St., Boston.
Greenfield Tap & Die Corp., Machy. Division, Greenfield, Mass.
New Britain Machine Co., New Britain, Conn.
Norton Co., Worcester, Mass.




## *A Tremendous Mechanical Industry—*

# The Railroads of America

And for every thunderous mile that is covered by passenger train or freight, much filing must be done—filing to fit and filing to repair the mighty engines of internal trade. It is filing best done with

# Nicholson Files

Fastest and smoothest cutting files because every keen edged shearing tooth is cut at an angle exactly correct.

Longest-service-giving files because they're tempered invariably right.

Specify NICHOLSON'S for maintained filing economy.

***File Filosophy and the NICHOLSON Catalog are of vital interest to file users.***

# NICHOLSON FILE CO.

**Providence, Rhode Island, U. S. A.**

Ransom Mfg. Co., Oshkosh, Wis.
Safety Emery Wheel Co., Springfield, Ohio.
Standard Electric Tool Co., Cincinnati.
Union Twist Drill Co., Athol, Mass.
U. S. Elec. Tool Co., Cincinnati, Ohio.
Walker Co., O. S., Worcester, Mass.

**Grinding Machines, Center**
Cincinnati Electrical Tool Co., Cincinnati, Ohio.
Gem Mfg. Co., Pittsburgh, Pa.
Standard Electric Tool Co., Cincinnati.
Wilmarth & Morman Co., Grand Rapids, Mich.

**Grinding Machines, Chucking**
Blanchard Machine Co., Cambridge, Mass.
Bryant Chucking Grinder Co., Springfield, Vt.
Heald Machine Co., Worcester, Mass.
Pratt & Whitney Co., Hartford, Conn.
Rivett Lathe & Grinder Co., Brighton, Boston.
Van Norman Mach. Tool Co., Springfield, Mass.
Worcester Machine Works, Worcester, Mass.

**Grinding Machines, Cutter and Reamer**
Armstrong Bros. Tool Co., Chicago, Ill.
Barnes, Wm. O., Leominster, Mass.
Barnes Co., W. F. & John, Rockford, Ill.
Blake & Johnson Co., Waterbury, Conn.
Blount Co., J. G., Woodland St., Everett, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling Mach. Co., Cincinnati, Ohio.
Diamond Machine Co., Providence, R. I.
Draper & Hall Co., Middletown, Conn.
Garvin Mach. Co., Spring and Varick St., N. Y. C.
Gisholt Mach. Co., Madison, Wis.
Gould & Eberhardt, Newark, N. J.
Grand Rapids (Mich.) Grinding Mach. Co.
Greenfield Machine Co., Greenfield, Mass.
Greenfield Tap & Die Corp., Machy. Division, Greenfield, Mass.
Heald Machine Co., Worcester, Mass.
Hunter Saw & Machine Co., Pittsburgh, Pa.
Ingersoll Milling Machine Co., Rockford, Ill.
Landis Tool Co., Waynesboro, Pa.
LeBlond Mach. Tool Co., R. K., Cincinnati, O.
McDonough Mfg. Co., Eau Claire, Wis.
Modern Tool Co., Erie, Pa.
Noble & Westbrook Mfg. Co., Hartford, Conn
Norton Co., Worcester, Mass.
Oakley Mach. Tool Co., Cincinnati, Ohio
Oesterlein Mach. Co., Cincinnati, Ohio.
Ott Grinder Co., Indianapolis, Ind.
Pratt & Whitney Co., Hartford, Conn.
Safety Emery Wheel Co., Springfield, Ohio.
Sellers & Co., Wm., Philadelphia, Pa.
Standard Tool Co., Cleveland, Ohio.
Sterling Grinding Wheel Co., Tiffin, Ohio.
Taylor & Fenn Co., Hartford, Conn.
Union Twist Drill Co., Athol, Mass.
U. S. Electrical Tool Co., Cincinnati, Ohio.
Universal Grinding Mach. Co., Fitchburg, Mass.
Walker Co., O. S., Worcester, Mass.
Wilmarth & Morman Co., Grand Rapids, Mich.
Woods Engineering Co., Alliance, Ohio.

**Grinding Machines, Cylindrical**
Brown & Sharpe Mfg. Co., Providence, R. I.
Bryant Chucking Grinder Co., Springfield, Vt.
Cincinnati Grinder Co., Cincinnati, Ohio.
Detroit Tool Co., Detroit, Mich.
Draper & Hall Co., Middletown, Conn.
Fitchburg Grinding Mach. Co., Fitchburg, Mass.
Greenfield Machine Co., Greenfield, Mass.
Heald Machine Co., Worcester, Mass.
Landis Tool Co., Waynesboro, Pa.
McDonough Mfg. Co., Eau Claire, Wis.
Manhattan Mach. Tool Co., Grand Rapids, Mich.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Norton Co., Worcester, Mass.
Oesterlein Mach. Co., Cincinnati, Ohio.
Ott Grinder Co., Indianapolis, Ind.
Pratt & Whitney Co., Hartford, Conn.
Rivett Lathe & Grinder Co., Brighton, Boston.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Universal Grinding Mach. Co., Fitchburg, Mass.
Van Norman Mach. Tool Co., Springfield, Mass.
Walker Co., O. S., Worcester, Mass.
Whitney & Son, Baxter D., Winchendon, Mass.

**Grinding Machines, Die**
Abrasive Mach. Tool Co., East Providence, R. I.
Bignall & Keeler Mach. Works, Edwardsville, Ill.
Blake & Johnson Co., Waterbury Conn.
Blanchard Mach. Co., Cambridge, Conn.
Diamond Machine Co., Providence, R. I.
Gale-Sawyer Co., 33 Wormwood St., Boston.
Geometric Tool Co., New Haven, Conn.
Heald Mach. Co., Worcester, Mass.
Murchey Mach. & Tool Co., Detroit, Mich.
National Machinery Co., Tiffin, Ohio.
Newton Mach. Tool Works, Philadelphia, Pa.
Noble & Westbrook Mfg. Co., Hartford, Conn.
Reid Brothers Co., Beverly, Mass.

**Grinding Machines, Disc**
Armstrong Bros. Tool Co., Chicago, Ill.
Badger Tool Co., Beloit, Wis.
Besly & Co., Charles H., Chicago, Ill.
Diamond Machine Co., Providence, R. I.
Gardner Machine Co., Beloit, Wis.
Landis Mach. Co., Waynesboro, Pa.
Rowbottom Machine Co., Waterbury, Conn.

**Grinding Machines, Drill**
Grand Rapids (Mich.) Grinding Mach. Co.
Greenfield Tap & Die Corp., Machy. Division, Greenfield, Mass.
La Salle Tool Co., La Salle, Ill.
Safety Emery Wheel Co., Springfield, Ohio.
Sellers & Co., Wm., Philadelphia, Pa.
Sterling Grinding Wheel Co., Tiffin, Ohio.
U. S. Elec. Tool Co., Cincinnati, Ohio.
Wilmarth & Morman Co., Grand Rapids, Mich.

**Grinding Machines, Face**
Blanchard Machine Co., Cambridge, Mass.
Bristol Machine Tool Co., Bristol, Conn.
Detroit Tool Co., Detroit, Mich.
Diamond Machine Co., Providence, R. I.
Persons-Arter Mach. Co., Worcester, Mass.

**Grinding Machines, Floor and Tool**
Blake & Johnson Co., Waterbury, Conn.
Blount Co., J. G., Woodland St., Everett, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Detroit Tool Co., Detroit, Mich.
Diamond Mach. Co., Providence, R. I.
Forbes & Myers, 170 Union St., Worcester, Mass.
La Salle Tool Co., La Salle, Ill.
Manhattan Mach. & Tool Co., Grand Rapids, Mich.
New Britain Machine Co., New Britain, Conn.
Noble & Westbrook Mfg. Co., Hartford, Conn.
Norton Co., Worcester, Mass.
Ransom Mfg. Co., Oshkosh, Wis.
Royersford Fdry. & Mach. Co., Royersford, Pa.
Safety Emery Wheel Co., Springfield, Ohio.
Sterling Grinding Wheel Co., Tiffin, Ohio.

**Grinding Machines, Gage**
Abrasive Mach. Tool Co., East Providence, R. I.
Ott Grinder Co., Indianapolis, Ind.
Reid Brothers Co., Beverly, Mass.
Rivett Lathe & Grinder Co., Brighton, Boston.

**Grinding Machines, Internal**
Brown & Sharpe Mfg. Co., Providence, R. I.
Bryant Chucking Grinder Co., Springfield, Vt.
Gale-Sawyer Co., 33 Wormwood St., Boston.
Garvin Mach. Co., Spring and Varick St., N. Y. C.
Greenfield Machine Co., Greenfield, Mass.
Greenfield Tap & Die Corp., Machy. Division, Greenfield, Mass.
Heald Machine Co., Worcester, Mass.
Landis Tool Co., Waynesboro, Pa.
Manhattan Mach. & Tool Co., Grand Rapids, Mich.
Ott Grinder Co., Indianapolis, Ind.
Pratt & Whitney, Hartford, Conn.
Rivett Lathe & Grinder Co., Brighton, Boston.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Universal Grinding Mach. Co., Fitchburg, Mass.
Van Norman Mach. Tool Co., Springfield, Mass.
Walker Co., O. S., Worcester, Mass.
Whitney & Son, Baxter D., Winchendon, Mass.
Worcester Machine Works, Worcester, Mass.

**Grinding Machines, Portable**
Armstrong-Blum Mfg. Co., Chicago, Ill.
Chicago Pneumatic Tool Co., Chicago, Ill.
Cincinnati Electrical Tool Co., Cincinnati, Ohio.
Clark Electric Co., Jas., Jr., Louisville, Ky.
Cleveland Pneumatic Tool Co., Cleveland, Ohio.
Gem Mfg. Co., Pittsburgh, Pa.
Independent Pneumatic Tool Co., Chicago, Ill.
Neil & Smith Electric Tool Co., Cincinnati, Ohio.
U. S. Electric Tool Co., Cincinnati, Ohio.
Wisconsin Electric Co., Racine, Wis.

**Grinding Machines, Radial**
Landis Tool Co., Waynesboro, Pa.
Rivett Lathe & Grinder Co., Brighton, Boston.
Van Norman Mach. Tool Co., Springfield, Mass.

**Grinding Machines, Ring Wheel**
Besly & Co., Charles H., Chicago, Ill.
Diamond Machine Co., Providence, R. I.
Gardner Machine Co., Beloit, Wis.

**Grinding Machines, Snagging**
Blount Co., J. G., Woodland St., Everett, Mass.
Diamond Machine Co., Providence, R. I.
Ransom Mfg. Co., Oshkosh, Wis.
Walker Co., O. S., Worcester, Mass.

**Grinding Machines, Surface**
Abrasive Mach. Tool Co., East Providence, R. I.
Blake & Johnson Co., Waterbury, Conn.
Blanchard Machine Co., Cambridge, Mass.
Bristol Machine Tool Co., Bristol, Conn.
Brown & Sharpe Mfg. Co., Providence, R. I.
Detroit Tool Co., Detroit, Mich.
Diamond Machine Co., Providence, R. I.
Draper & Hall Co., Middletown, Conn.
Heald Machine Co., Worcester, Mass.
La Salle Tool Co., La Salle, Ill.
Newton Mach. Tool Works, Philadelphia, Pa.
Noble & Westbrook Mfg. Co., Hartford, Conn.
Persons-Arter Mach. Co., Worcester, Mass.
Pratt & Whitney Co., Hartford, Conn.
Reid Brothers Co., Beverly, Mass.
Rowbottom Machine Co., Waterbury, Conn.
Safety Emery Wheel Co., Springfield, Ohio.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Universal Grinding Mach. Co., Fitchburg, Mass.
Walker Co., O. S., Worcester, Mass.
Wilmarth & Morman Co., Grand Rapids, Mich.

**Grinding Machines, Tool Post**
Gale-Sawyer Co., 33 Wormwood St., Boston.

**Grinding Machines, Tool**
Gisholt Machine Co., Madison, Wis.
Herbert, Ltd., Alfred, 54 Dey St., N. Y. City.
Sellers & Co., Wm., Philadelphia, Pa.

**Grinding Machines, Universal**
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Grinder Co., Cincinnati, Ohio.
Draper & Hall Co., Middletown, Conn.
Grand Rapids (Mich.) Grinding Mch. Co.
Greenfield Machine Co., Greenfield, Mass.
Greenfield Tap & Die Corp., Machy. Division, Greenfield, Mass.
Independent Pneumatic Tool Co., Chicago, Ill.
Landis Tool Co., Waynesboro, Pa.
McDonough Mfg. Co., Eau Claire, Wiss.
Ott Grinder Co., Indianapolis, Ind.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Universal Grinding Mach. Co., Fitchburg Mass.
Wilmarth & Morman Co., Grand Rapids, Mich.
Woods Engineering Co., Alliance, Ohio.

**Grinding Wheels**
Carborundum Co., Niagara Falls, N. Y.
Cutter & Wood Supply Co., Boston.
Dickinson, Thomas L., 64 Nassau St., N. Y. City.
Hampden Corundum Wheel Co., Springfield, Mass.
Maxf Grinding Wheel Co., Chester, Mass.
Norton Co., Worcester, Mass.
Sterling Grinding Wheel Co., Tiffin, Ohio.
Superior Corundum Wheel Co., Waltham, Mass.
Vitrified Wheel Co., Westfield, Mass.
Wausau Abrasives Co., Chicago, Ill.

**Grindstones and Frames**
Oliver Machinery Co., Grand Rapids, Mich.

**Gun Barrel Machinery**
Baush Machine Tool Co., Springfield, Mass.
Pratt & Whitney Co., Hartford, Conn.
Sloan & Chace Mfg. Co., Newark, N. J.

**Hammering Machines**
Langelier Mfg. Co., Arlington, Cranston, R. I.

**Hammers, Drop**
Bradley & Son, C. C., Syracuse, N. Y.
Erie Foundry Co., Erie, Pa.
Niles-Bement-Pond Co., 111 Broadway, N. Y. C.
Toledo Mach. & Tool Co., Toledo, Ohio.

**Hammers, Electric**
Beaudry & Co., Boston, Mass.
Nazel Engineering & Mach. Works, Philadelphia.

**Hammers, Pneumatic**
Cleveland Pneumatic Tool Co., Cleveland, Ohio.
Independent Pneumatic Tool Co., Chicago, Ill.
Ingersoll-Rand Co., 11 Broadway, N. Y. City.

**Hammers, Power**
Beaudry & Co., Boston, Mass.
Bliss Co., E. W., 1 Adams St., Brooklyn, N. Y.
Bradley & Son, C. C., Syracuse, N. Y.
Erie Foundry Co., Erie, Pa.
Nazel Engineering & Mach. Works, Philadelphia.
Niles-Bement-Pond Co., 111 Broadway, N. Y. C.
West Tire Setter Co., Rochester, N. Y.

**Hangers, Shafting**
Armstrong Bros. Tool Co., Chicago, Ill.
Bond Foundry & Machine Co., Manheim, Pa.
Brown & Sharpe Mfg. Co., Providence, R. I.
Gurney Ball Bearing Co., Jamestown, N. Y.
Hyatt Roller Bearing Co., Harrison, N. J.
New Departure Mfg. Co., Bristol, Ct.
Royersford Foundry & Mach. Co., Royersford, Pa.
S K F Industries, Inc., Hartford, Conn.

**Hardening, Case-Hardening and Tempering**
Bennett Co., W. R., Elmwood, Conn.
Eclipse Fuel Engineering Co., Rockford, Ill.
General Machine Works, York, Pa.
Hartford Machine Screw Co., Hartford, Conn.
Williams & Co., J. H 35 Richards St., Brooklyn

**Hardness Testing Apparatus**
Shore Instrument & Mfg. Co., N. Y. City.

**Hobbing Machines**
Adams Co., 1901 Bridge St., Dubuque, Iowa.
Barber-Colman Co., Rockford, Ill.
Bilton Mach. Tool Co., Bridgeport, Conn.
Gould & Eberhardt, Newark, N. J.
Lees-Bradner Co., Cleveland, Ohio.
M-C Mfg. Co., 38 Congress St., Newark, N. J.

**Hobs**
Barber-Colman Co., Rockford, Ill.
Boston Gear Works, Norfolk Downs, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I
Goddard Tool Co., Chicago, Ill.
Gould & Eberhardt, Newark, N. J.
Greenfield Tap & Die Corp., Greenfield, Mass.
Lees-Bradner Co., Cleveland, Ohio.
Michigan Tool Co., Detroit, Mich.
National Tool Co., Cleveland, Ohio.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Union Twist Drill Co., Athol, Mass.

**Hoists, Electric**
Crocker-Wheeler Co., Ampere, N. J.
Euclid Crane & Hoist Co., Euclid, Ohio.
Link-Belt Co., Chicago, Philadelphia.
Niles-Bement-Pond Co., 111 Broadway, N. Y. C.
Northern Engineering Works, Detroit, Mich
Pawling & Harnischfeger Co., Milwaukee, Wis.
Shepard Electric C. & H. Co., Montour Falls, N. Y.
Toledo Bridge & Crane Co., Toledo, Ohio.
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.
Yale & Towne Mfg. Co., 9 E. 40th St., N. Y. C.

**Hoists, Hand**
Canton Foundry & Machine Co., Canton, Ohio.
Chisholm-Moore Mfg. Co., Cleveland, O.
Ford Chain Block & Mfg. Co., Philadelphia, Pa.
Harrington, Son & Co., Edwin, Phila., Penn.
Reading Chain Block Co., Reading, Penn.
Yale & Towne Mfg. Co., 9 E. 40th St., N. Y. C.

**Hoists, Pneumatic**
Independent Pneumatic Tool Co., Chicago, Ill.
Ingersoll-Rand Co., 11 Broadway, N. Y. City.
Whiting Foundry Equipment Co., Harvey, Ill
Worthington Pump & Mchy. Corp., N. Y. City

**Holders-On, Pneumatic**
Independent Pneumatic Tool Co., Chicago, Ill.

**Hydraulic Leather**
Schieren Co., Chas. A., 41 Ferry St., N. Y. City.

**Hydraulic Machinery**
Worthington Pump & Mchy. Corp., N. Y. City

**Igniters, Gas Engine**
Doehler Die Casting Co., Brooklyn, N. Y.
Holtzer-Cabot Electric Co., Boston

**Indicators, Speed and Test**
Boston Tool & Mfg. Co., Boston, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Marvin & Casler Co., Canastota, N. Y.
Norton Co., Worcester, Mass.
Starrett Co., L. S., Athol, Mass.
Veeder Mfg. Co., 15 Sargeant St., Hartford, Conn.
Waterston, J. M., 77 Woodward Ave., Detroit.

**Inspectors**
Souther Engineering Corp., Ry., Hartford, Conn.

**Jacks, Hydraulic**
Watson-Stillman Co., 42 Church St., N. Y. C.

**Jacks, Planer**
Armstrong Bros. Tool Co., Chicago, Ill.

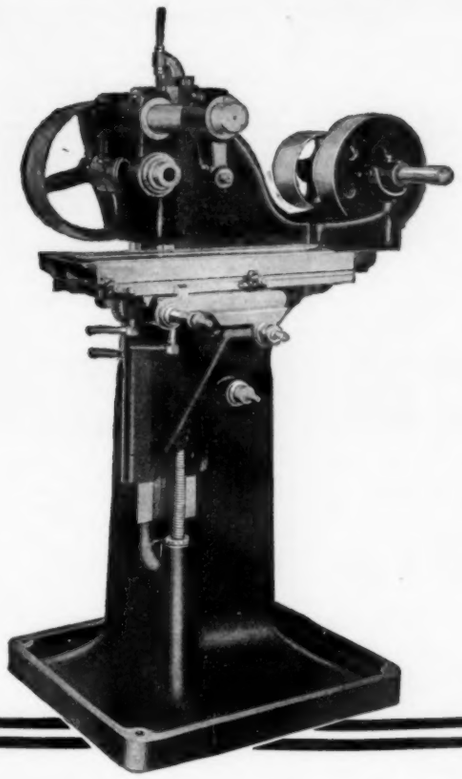
**Japans**
Hilo Varnish Corporation, 8 Gerry St., Brooklyn.

**Jigs and Fixtures (See Tool Work)**

**Kettles, Soda**
Brown & Sharpe Mfg. Co., Providence, R. I.
Gray & Prior Mach. Co., Hartford, Conn.
Manufacturing Equipment & Engineering Co., Framingham, Mass.

**Keyseating Machines**
Baker Bros., Toledo, Ohio.
Lapointe Co., J. N., New London, Conn.
Lapointe Machine Tool Co., Hudson, Mass.
Morton Mfg. Co., Muskegon Heights, Mich.
National Machine Tool Co., Cincinnati, Ohio
Newton Machine Tool Wks., Philadelphia, Penn
Niles-Bement-Pond Co., 111 Broadway, N. Y. C.

**Keys, Machine**
Detroit Twist Drill Co., 644 Fort St., Detroit.
Joltrup Steel Products Co., Beaver Falls, Pa.
Morton Mfg. Co., Muskegon Heights, Mich.
Standard Gauge Steel Co., Beaver Falls, Pa.
Whitney Mfg. Co., Hartford, Conn.
Williams & Co., J. H., 35 Richards St., Brooklyn.



# For Medium Weight Work

This is model No. 1, Standard Hand and Weight Feed Milling Machine.

It is a hard worker that contains every bit of the well known Standard Quality.

If you are looking for this type of Miller you had best compare this machine with other makes on the market.

***Full details are to be had in our new bulletin. We will gladly send you a copy. Write us today.***

## The Standard Engineering Works

**Pawtucket, R. I., U. S. A.**

***Manufacturers of Hand and Weight Feed Milling Machines; Hand, Weight and Power Feed Milling Machines; Hand, Weight, Power Feed and Automatic Spline Milling Machines.***

## FILES
## DRILLS
## TAPS and DIES
## MACHINISTS' TOOLS
## BOLTS and SCREWS
## FACTORY SUPPLIES
## Etc., Etc.

In this period of reconstruction it is more important than ever to keep up the stock in your storeroom—have the gaps filled in and leveled off—to be prepared to better meet the new conditions as they develop and the competition which is sure to come.

We are ready for you with a large and assorted line of

**General Hardware Tools and Factory Supplies**

and solicit an opportunity to figure on your requirements.

## HAMMACHER SCHLEMMER & CO.

***Hardware, Tools and Factory Supplies***

**New York Since 1848** 4th Ave. and 13th St.

**Knives, Machine**
Simonds Mfg. Co., Fitchburg, Mass.

**Knurl Holders**
Graham Mfg. Co., Providence, R. I.
Williams & Co., J. H., 35 Richards St., Brooklyn.

**Lacing Leather**
Schieren Co., Chas. A., 41 Ferry St., N. Y. City.

**Ladders, Permanent**
New Britain Machine Co., New Britain, Conn.

**Lamp Guards**
Flexible Steel Lacing Co., Chicago, Ill.

**Lamps, Electric**
General Electric Co., Schenectady, N. Y.
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.

**Lathe Attachments**
Ames Co., B. C., Waltham, Mass.
Dalton Mfg. Corp., 1911 Park Ave., N. Y. City.
Flather & Co., Inc., Nashua, N. H.
Hendey Mach. Co., Torrington, Ct.
Kell, Hock & Co., Newark, N. J.
Manufacturers Hardware Corp., Milwaukee, Wis.
Rivett Lathe & Grinder Co., Brighton, Boston.
Sloan & Chace Mfg. Co., Newark, N. J.
William & Co., J. H., 35 Richards St., Brooklyn.

**Lathe Pans, Portable**
Lyon Metallic Mfg. Co., Aurora, Ill.
New Britain Machine Co., New Britain, Conn.

**Lathe Tools**
Armstrong Bros. Tool Co., Chicago, Ill.
Federal Products Corp., Providence, R. I.
Gisholt Mach. Co., Madison, Wis.
Lovejoy Tool Co., Springfield, Vt.
Parker Mach. Co., 221 High St., Boston.
Union Tool Co., Orange, Mass.
Western Tool & Mfg. Co., Springfield, Ohio.
Williams & Co., J. H., 35 Richards St., Brooklyn.

**Lathes, Automatic and Semi-Automatic**
Coats Mach. Tool Co., 108-112 W. 40th St., N.Y.C.
Gisholt Mach. Co., Madison, Wis.
Jones & Lamson Mach. Co., Springfield, Vt.
National Acme Co., Windsor, Vt.
Potter & Johnston Mach. Co., Pawtucket, R. I.
Reed-Prentice Co., Worcester, Mass.
Steinle Turret Mach. Co., Madison, Wis.
Wood Turret Mach. Co., Brazil, Ind.

**Lathes, Bench**
Ames Co., B. C., Waltham, Mass.
Blount Co., J. G., Woodland St., Everett, Mass.
Dalton Mfg. Corp., 1911 Park Ave., N. Y. City.
Diamond Mach. Co., Providence, R. I.
Greenfield Tap & Die Corp., Machy. Division, Greenfield, Mass.
Oliver Mfg. Co., W. W., Buffalo, N. Y.
Potter Tool & Mach. Wks., 79 E. 130 St., N. Y.
Pratt & Whitney Co., Hartford, Conn.
Rivett Lathe & Grinder Co., Brighton, Boston.
Seneca Falls Mfg. Co., Seneca Falls, N. Y.
Shepard Lathe Co., Cincinnati, Ohio.
Sloan & Chace Mfg. Co., Newark, N. J.
South Bend Lathe Works, South Bend, Ind.
Stark Tool Co., Waltham, Mass.
Van Norman Mach. Tool Co., Springfield, Mass.
Wade-American Precision Tool Co., Boston.

**Lathes, Boring**
Gisholt Mach. Co., Madison, Wis.
Niles-Bement-Pond Co., 111 Broadway, N. Y. C.
Potter & Johnston Mach. Co., Pawtucket, R. I.

**Lathes, Chucking (See Lathes, Horizontal Turret)**

**Lathes, Engine**
Adams Mfg. Co., O. R., Rochester, N. Y.
American Tool Wks. Co., Cincinnati, Ohio.
Barnes Co., W. F. & John, Rockford, Ill.
Barnes Drill Co., 830 Chestnut St., Rockford, Ill.
Blount Co., J. G., Woodland St., Everett, Mass.
Boye & Emmes Mach. Tool Co., Cincinnati, O.
Bradford Machine Tool Co., Cincinnati, Ohio.
Bullard Machine Tool Co., Bridgeport, Conn.
Carroll-Jamieson Mach. Tool Co., Batavia, Ohio.
Champion Tool Works Co., Cincinnati, Ohio.
Cincinnati Lathe & Tool Co., Cincinnati, Ohio.
Crawford Machine Tool Co., 21 Park Row, N. Y.
Dalton Mfg. Corp., 1911 Park Ave., N. Y. City.
Davis Mach. Tool Co., Rochester, N. Y.
Fitchburg Machine Works, Fitchburg, Mass.
Flather & Co., Nashua, N. H.
Giddings & Lewis Mfg. Co., Fond du Lac, Wis.
Gisholt Mach. Co., Madison, Wis.
Greaves, Klusman Tool Co., Cincinnati, Ohio.
Greaves Machine Tool Co., Cincinnati.
Hamilton Machine Tool Co., Hamilton, Ohio.
Hendey Machine Co., Torrington, Conn.
Hill, Clarke & Co., 156 Oliver St., Boston, Mass.
LeBlond Mach. Tool Co., The R. K., Cincinnati.
Lodge & Shipley Machine Tool Co., Cincinnati,.
Monarch Machine Tool Co., Sidney, Ohio.
Morris Machine Tool Co., Cincinnati, Ohio.
Mueller Mach. Tool Co., Cincinnati, Ohio.
Niles-Bement-Pond Co., 111 Broadway, N. Y. C.
Oliver Machinery Co., Grand Rapids, Mich.
Pittsburgh Mach. Tool Co., Braddock, Penn.
Porter-Cable Machine Co., Syracuse, N. Y.
Prentiss & Co., Henry, Singer Bldg., N. Y. City.
Reed-Prentice Co., Worcester, Mass.
Rockford Lathe & Drill Co., Rockford, Ill.
Rockford Tool Co., Rockford, Ill.
Sebastian Lathe Co., 117 Culvert St., Cincinnati
Seneca Falls Mfg. Co., Seneca Falls, N. Y.
Shepard Lathe Co., Cincinnati, Ohio.
Sidney Machine Tool Co., Sidney, Ohio
Springfield Mach. Tool Co., Springfield, Ohio.
Strong, Carlisle & Hammond Co., Cleveland, O.
Union Lathe Works, York, Pa.
Whitcomb-Blaisdell Mach. Tool Co., Worcester.
Wickes Bros., Saginaw, Mich.
Worcester Lathe Co., Worcester, Mass.

**Lathes, Extension and Gap**
American Tool Wks., Co., Cincinnati, Ohio.
Barnes Drill Co., 830 Chestnut St., Rockford, Ill.
Harrington, Son & Co., Edwin, Philadelphia, Pa.
Niles-Bement-Pond Co., 111 Broadway, N. Y. C.

**Lathes, Foot Power**
Barnes Co., W. F. & John, Rockford, Ill.
Dalton Mfg. Corp., 1911 Park Ave., N. Y. City.
Seneca Falls Mfg. Co., Seneca Falls, N. Y.
Shepard Lathe Co., Cincinnati, Ohio.

**Lathes, Heavy Duty Projectile Boring**
Axelson Machine Co., Los Angeles, Calif.
Pittsburgh Mach. Tool Co., Braddock, Penn.
Taylor Mach. Co., Cleveland, O.

**Lathes, Horizontal Turret**
Acme Machine Tool Co., Cincinnati, Ohio.
Dreses Mach. Tool Co., Cincinnati, Ohio.
Foster Mach. Co., Elkhart, Ind.
Gisholt Mach. Co., Madison, Wis.
International Mach. Tool Co., Indianapolis, Ind.
Jones & Lamson Mach. Co., Springfield, Vt.
Milholland Mach. Co., W. K., Indianapolis, Ind.
New Britain Machine Co., New Britain, Conn.
Pratt & Whitney Co., Hartford, Conn.
Reed-Prentice Co., Worcester, Mass.
Steinle Turret Mach. Co., Madison, Wis.
Warner & Swasey Co., Cleveland, Ohio.
Wood Turret Mach. Co., Brazil, Ind.

**Lathes, Polishing (See Polishing and Buffing Machines)**

**Lathes, Relieving**
Cleveland Milling Mach. Co., Cleveland, Ohio.

**Lathes, Speed and Hand**
Blount Co., J. G., Woodland St., Everett, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Diamond Machine Co., Providence, R. I.
Garvin Machine Co., N. Y. City.
Greenfield Tap & Die Corp., Machy. Division, Greenfield, Mass.
Oliver Machinery Co., Grand Rapids, Mich.
Seneca Falls Mfg. Co., Seneca Falls, N. Y.

**Lathes, Threading**
Automatic Mach. Co., Bridgeport, Conn.
Rivett Lathe & Grinder Co., Brighton, Boston.
Sloan & Chace Mfg. Co., Newark, N. J.

**Lathes, Vertical Turret**
Bullard Mach. Tool Co., Bridgeport, Conn.

**Lathes, Wood Turning**
Barnes Co., W. F. & John, Rockford, Ill.
Blount Co., J. G., Woodland St., Everett, Mass.
Oliver Machinery Co., Grand Rapids, Mich.
Seneca Falls Mfg. Co., Seneca Falls, N. Y.

**Letters and Figures**
Brown & Sharpe Mfg. Co., Providence, R. I.
Hoggson & Pettis Mfg. Co., New Haven, Conn.
Pannier Bros. Stamp Co., Pittsburgh, Penn.

**Lockers, Clothes**
Lyon Metallic Mfg. Co., Aurora, Ill.
Manufacturing Equipment & Engineering Co., Framingham, Mass.

**Lubricants**
Fiske Bros. Refining Co., 24 State St., N. Y. C.
Oakley Chemical Co., 24 Thames St., N. Y. City.
Royersford Fdry. & Mach. Co., Royersford, Pa.
Texas Co., 17 Battery Place, N. Y.
White & Bagley Co., Worcester, Mass.

**Lubricating Systems**
Bowser & Co., S. F., Fort Wayne, Ind.

**Machinists' Small Tools**
Armstrong Bros. Tool Co., Chicago, Ill.
Athol Machine Co., Athol, Mass.
Brown & Sharpe Mfg. So., Providence, R. I.
Cleveland Twist Drill Co., Cleveland, Ohio.
Grover File Co., Nashua, N. H.
Hammacher, Schlemmer & Co., N. Y. City.
Keystone Reamer & Tool Co., Millersburg, Pa.
Pratt & Whitney Co., Hartford, Conn.
Slocomb Co., J. T., Providence, R. I.
Smith & Hemeway Co., 263 B'way, N. Y. City.
Starrett Co., L. S., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Union Tool Co., Orange, Mass.
Williams & Co., J. H., 35 Richards St., Brooklyn.

**Mandrels, Expanding**
American Pneumatic Chuck Co., Chicago, Ill.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cochrane-Bly Co., Rochester, N. Y.
Manufacturers Equipment Co., Chicago, Ill.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Western Tool & Mfg. Co., Springfield, Ohio.

**Mandrels, Solid**
Advance Tool Co., Cincinnati, Ohio.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cleveland Twist Drill Co., Cleveland, Ohio.
Lincoln Twist Drill Co., Taunton, Mass.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Nicholson & Co., W. H., Wilkes-Barre, Penn.
Standard Tool Co., Cleveland, Ohio.

**Marking Devices (See Stamps, Steel)**

**Marking Machines**
Engravers & Printers Mch. Co., Sag Harbor, N. Y.
Federal Products Corp, Providence, R. I.
Noble & Westbrook Mfg. Co., Hartford, Conn.

**Measuring Machines**
Norma Co. of America, 1790 Broadway, N. Y. C.
Pratt & Whitney Co., Hartford, Conn.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

**Metal Cleaning Equipment**
Pangborn Corp., Hagerstown, Md.

**Metal Finishes**
Hilo Varnish Corporation, 8 Gerry St., Brooklyn.

**Metals, Alloy**
International Nickel Co., N. Y. City.

**Meters, Steam Flow**
General Electric Co., Schenectady, N. Y.

**Micrometer Calipers**
Almond Mfg. Co., T. R. Ashburnham, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Slocomb Co., J. T., Providence, R. I.
Starrett Co., L. S. Athol, Mass.

**Milling Attachments**
Adams Co., 1902 Bridge St., Dubuque, Iowa
American Pneumatic Chuck Co., Chicago, Ill.
Becker Milling Machine Co., Hyde Park, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling Mach. Co., Cincinnati, Ohio.
Cleveland Milling Mach. Co., Cleveland, Ohio.
Fox Machine Co., Jackson, Mich.
Garvin Mach. Co., Spring & Varick Sts., N. Y. C.
Hall Gas Engine Co., Bridesburg, Philadelphia.
Hendey Machine Co., Torrington, Conn.
Ingersoll Milling Machine Co., Rockford, Ill.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
LeBlond Mach Tool Co., R. K., Cincinnati, O.
Oesterlein Mach. Co., Cincinnati, Ohio.
Porter-Cable Machine Co., Syracuse, N. Y.
Potter & Johnston Mach. Co., Pawtucket, R. I.
Sloan & Chace Mfg. Co., Newark, N. J.
Standard Engineering Wks., Pawtucket, R. I.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Whiting & Comstock, Hartford, Conn.

**Milling Machines, Automatic**
Bilton Mach. Tool Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling Machine Co., Cincinnati, Ohio
Cleveland Milling Mach. Co., Cleveland, Ohio.
Pratt & Whitney Co., Hartford, Conn.

**Milling Machines, Bench**
Ames Co., B. C., Waltham, Mass.
Burke Machine Tool Co., Conneaut, Ohio.
Carter & Hakes Machine Co., Winsted, Conn.
Cleveland Milling Mach. Co., Cleveland, Ohio.
Pratt & Whitney Co., Hartford, Conn.
Sloan & Chace Mfg. Co., Newark, N. J.
Stark Tool Co., Waltham, Mass.
Van Norman Mach. Tool Co., Springfield, Mass.

**Milling Machines, Hand**
Adams Co., 1902 Bridge St., Dubuque, Iowa.
Becker Milling Mach. Co., Hyde Park, Mass.
Bristol Machine Tool Co., Bristol, Conn.
Brown & Sharpe Mfg. Co., Providence, R. I.
Burke Machine Tool Co., Conneaut, Ohio.
Carter & Hakes Mach. Co., Winsted, Conn.
Cincinnati Milling Mach. Co., Cincinnati, Ohio.
Cleveland Milling Mach. Co., Cleveland, Ohio.
Fox Machine Co., Jackson, Mich.
Garvin Mach. Co., Spring & Varick Sts., N. Y. C.
Pratt & Whitney Co., Hartford, Conn.
Standard Engineering Co., Pawtucket, R. I.
Steptoe Co., John, Northside, Cincinnati, Ohio
Van Norman Mach. Tool Co., Springfield, Mass
Whitney Mfg. Co., Hartford, Conn.
Wisconsin Miller Mfg. Co., Station A, Milwaukee.

**Milling Machines, Horizontal and Planer Type**
Adams Co., 1902 Bridge St., Dubuque, Iowa.
Beaman & Smith Co., Providence, R. I.
Betts Machine Co., Rochester, N. Y.
Ingersoll Milling Mach. Co., Rockford, Ill.
Newton Mach. Tool Works, Philadelphia, Penn.
Niles-Bement-Pond Co., 111 Broadway, N .Y. C.

**Milling Machines, Plain**
Adams Co., 1902 Bridge St., Dubuque, Iowa.
Becker Milling Mach. Co., Hyde Park, Mass.
Betts Machine Co., Rochester, N. Y.
Bilton Mach. Tool Co., Bridgeport, Conn.
Bristol Machine Tool Co., Bristol, Conn.
Brown & Sharpe Mfg. Co., Providence, R. I.
Chicago Mach. Tool Co., Chicago, Ill.
Cincinnati Milling Mach. Co., Cincinnati, Ohio.
Cleveland Milling Mach Co., Cleveland, Ohio.
Cochrane-Bly Co., Rochester, N. Y.
Fox Machine Co., Jackson, Mich.
Garvin Machine Co., N. Y. City.
Gooley & Edlund, Cortland, N. Y.
Hendey Machine Co., Torrington, Conn.
Hill, Clarke & Co., 156 Oliver St., Boston, Mass.
Ingersoll Milling Mach. Co., Rockford, Ill.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Station A, Milwaukee, Wis.
LeBlond Mach. Tool Co., The R. K., Cincinnati.
Oesterlein Mach. Co., Cincinnati, Ohio.
Potter & Johnston Mach. Co., Pawtucket, R. I.
Rockford Milling Machine Co., Rockford, Ill.
Standard Engineering Wks., Pawtucket, R. I.
Steptoe Co., John, Northside, Cincinnati, Ohio.
Van Norman Mach. Tool Co., Springfield, Mass.

**Milling Machines, Portable**
Newton Mach. Tool Works, Philadelphia, Penn.
Underwood, Corp., H. B., Philadelphia, Penn.

**Milling Machines, Thread**
Automatic Mach. Co., The, Bridgeport, Conn.
Foster Mach. Co., Elkhart, Ind.
Gisholt Mach. Co., Madison, Wis.
Hall Gas Engine Co., Bridesburg, Philadelphia.
Harrington Son & Co., Edwin, Philadelphia, Pa
Lees-Bradner Co., Cleveland, Ohio.
Newton Mach. Tool Works, Philadelphia, Pa.
Pratt & Whitney Co., Hartford, Conn.
Waltham Mach. Works, Waltham, Mass.

**Milling Machines, Universal**
Becker Milling Mach. Co., Hyde Park, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling Mach. Co., Cincinnati, Ohio.
Cleveland Milling Mach. Co., Cleveland, Ohio.
Cochrane-Bly Co., Rochester, N. Y.
Fox Machine Co., Jackson, Mich.
Garvin Mach. Co., N. Y. City.
Hendey Mach. Co., Torrington, Conn.
Hill, Clarke & Co., 156 Oliver St., Boston, Mass.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Station A, Milwaukee, Wis.
LeBlond Mach. Tool Co., R. K., Cincinnati, Ohio.
Oesterlein Mach. Co., Cincinnati, Ohio.
Potter & Johnson Machine Co., Pawtucket, R. I.
Van Norman Mach. Tool Co., Springfield, Mass.

**Milling Machines, Vertical**
Adams Co., 1902 Bridge St., Dubuque, Iowa.
Becker Milling Mach. Co., Hyde Park, Mass.
Betts Machine Co., Rochester, N. Y.
Bristol Machine Tool Co., Bristol, Conn.
Brown & Sharpe Mfg. Co., Providence, R. I.
Burke Machine Tool Co., Conneaut, Ohio.
Cincinnati Milling Mach. Co., Cincinnati, Ohio.
Cleveland Milling Mach. Co., Cleveland, Ohio.
Clough, R. M., Meriden, Conn.
Cochrane-Bly Co., Rochester, N. Y.
Garvin Machine Co., N. Y. City.
Hill, Clarke & Co., 156 Oliver St., Boston, Mass.
Ingersoll Milling Mach. Co., Rockford, Ill.
Kearney & Trecker Co., Milwaukee, Wis.
Knight Mach. Co., 3920 W. Pine St., St. Louis.
LeBlond Mach. Tool Co., The R. K., Cincinnati.
Newton Mach. Tool Works, Philadelphia, Pa.

# MODERN

## Self-Opening Die Heads

**The Most Accurate, the Most Dependable, the Most Durable Self-Opening Die Heads Obtainable**

**Because** of other superior qualities Modern Self-Opening Die Heads have been adopted as Standard Equipment on about 90% of the highest grade turret machines made in America. This is significant because much of the Reputation of any machine depends upon the character and satisfactory operation of the equipment supplied.

**Moderns** are for use on turret of any hand or automatic screw machine, and when fitted with closing device on lathes, drill presses, and other revolving spindle machines.

**Moderns** offer many advantages over any other die heads obtainable. They're simple in design—have few parts. They do not clog easily. May be quickly and easily cleaned WITHOUT DISMOUNTING, and without taking entirely apart.

**Every Modern** Self-Opening Die Head has a wide range of diameters which may be cut, thus avoiding the necessity of purchasing a separate head for different jobs.

**Modern's** chief claim to favor is UNEQUALED ACCURACY. Chasers cannot change position during work. When set they are as rigid as solid heads. Chasers will not "rock", "cock" or "bell at the mouth."

**Let us tell you more about these wonderful aids to accuracy and big production in threading operations. Send for bulletins.**

**OTHER MODERN TOOLS**

—Plain Grinders
—Universal Grinders
—Internal Grinders
—Chaser Grinders
—"Magic" Chucks
—Tapping Attachments
—Collapsible Taps

## MODERN TOOL CO.

MAIN OFFICE AND WORKS **ERIE, PA.** FOURTH AND FRENCH STS.

BRANCH OFFICES:

New York, N. Y., 2 Rector St.
Chicago, Ill., 32 N. Clinton St.
Detroit, Mich., 40 Larned St., East.
Cincinnati, Ohio, 2 Greenwood Office Exch.
Cleveland, Ohio, Guardian Bldg.
Export Dept., 2 Rector St., N. Y. City.
Canadian Agents: Rudel-Belnap Machinery Co., Ltd., Toronto and Montreal.
California Representatives: Herberts Machinery & Supply Co., Los Angeles and San Francisco

Niles-Bement-Pond Co., 111 Broadway, N. Y. C.
Potter & Johnston Mach. Co., Pawtucket, R. I.
Rockford Milling Machine Co., Rockford, Ill.
Van Norman Mach. Tool Co., Springfield, Mass

**Milling Machines, Worm**
Cleveland Auto. Mach. Co., Cleveland, Ohio.
Lees-Bradner Co., Cleveland, Ohio.
Newton Mach. Tool Works, Philadelphia, Pa.
Waltham Mach. Works, Waltham, Mass.

**Motors, Electric**
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Crocker-Wheeler Co., Ampere, N. J.
General Electric Co., Schenectady, N. Y.
Holtzer-Cabot Electric Co., Boston.
Reliance Electric & Engineering Co., Cleveland
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.
Wisconsin Electric Co., Racine, Wis.

**Nickel Plating Outfits**
Cutter & Wood Supply Co., Boston.

**Nut Tappers (See Bolt and Nut Machinery)**

**Nuts, Lock (See Lock-Nuts)**

**Oil and Grease Cups**
Bay State Stamping Co., Worcester, Mass.
Bowen Products Corp., Auburn, N. Y.
Gits Bros. Mfg. Co., Chicago, Ill.
Michigan Lubricator Co., Detroit, Mich.
Tucker, W. A. & C. F., Hartford, Conn.
Wahlstrom Tool Co., Brooklyn, N. Y.

**Oilers**
Gem Mfg. Co., Pittsburgh, Penn.
Michigan Lubricator Co., Detroit, Mich.

**Oil Filtering and Storage Systems**
Bowser & Co., S. F., Fort Wayne, Ind.
Gilbert & Barker Mfg. Co., Springfield, Mass.
Oil & Waste Saving Mach. Co., Philadelphia, Pa.
Wayne Oil Tank & Pump Co., Fort Wayne, Ind.

**Oil Grooving Machines**
Fischer Machine Co., Philadelphia, Pa.
National Machine Tool Co., Cincinnati, Ohio

**Oil Stones**
Norton Co., Worcester, Mass.

**Oil Storage Engineers**
Gilbert & Barker Mfg. Co., Springfield, Mass.
Wayne Oil Tank & Pump Co., Fort Wayne, Ind.

**Oils**
Fiske Bros. Refining Co., 24 State St., N. Y. C.
Texas Co., 17 Battery Place, N. Y.
White & Bagley Co., Worcester, Mass.

**Oils Soluble**
Fiske Bros., Refining Co., 24 State St., N. Y. C

**Oxygen**
Davis-Bournonville Co., Jersey City, N. J.

**Packing, Hydraulic**
Chicago Rawhide Mfg. Co., Chicago, Ill.
Graton & Knight Mfg. Co., Worcester, Mass.
Schieren Co., Chas. A., 41 Ferry St., N. Y. City.
Sweet & Doyle F. & M. Co., Green Island, N. Y.

**Paints, Machinery**
Hilo Varnish Corp., 8 Gerry St., Bklyn., N. Y.

**Pattern Shop Machinery (See Woodworking Machinery)**

**Patterns, Wood and Metal**
Mehl Mach. Tool & Die Co., Roselle, N. J.
Sweet & Doyle F. & M. Co., Green Island, N. Y.

**Pipe Bending Machines**
Baird Pneumatic Tool Co., Kansas City, Mo.
Harrington Son & Co., Edwin, Phila., Penn.
Treadwell Eng'g. Co., 88 West St., N. Y. City.
Underwood Corp., H. B., Philadelphia, Penn.

**Pipe Cutting and Threading Machines**
Bignall & Keeler Mach. Wks., Edwardsville, Ill.
Curtis & Curtis Co., Bridgeport, Conn.
Greenfield Tap & Die Corp., Greenfield, Mass.
Harrington, Son & Co., Edwin, Philadelphia, Pa
Landis Mach. Co., Waynesboro, Penn.
Merrell Mfg. Co., Toledo, Ohio.
Murchey Mach. & Tool Co., Detroit, Mich.
Saunders Sons, D., Yonkers, N. Y.
Standard Eng'g. Wks., Ellwood City, Penn.
Treadwell Eng'g. Co., 88 West St., N. Y. City
Trimont Mfg. Co., 55 Amory St., Roxbury, Mass.

**Pipe Fitters' Tools**
Butterfield & Co., Derby Line, Vt.
Cleveland Twist Drill Co., Cleveland, Ohio.
Greenfield Tap & Die Corp., Greenfield, Mass.
Saunders Sons, D., Yonkers, N. Y.
Standard Tool Co., Cleveland, Ohio.
Trimont Mfg. Co., 55 Amory St., Roxbury, Mass.
Williams & Co., J. H., 35 Richard St., Brooklyn.
National Acme Co., Windsor, Vt.
Persons-Arter Machine Co., Worcester, Mass.
Potter & Johnston Mach. Co., Pawtucket, R. I.
Pratt & Whitney Co., Hartford, Conn.
Walker Co., O. S., Worcester, Mass.

**Planer Parallels**
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Walker Co., O. S., Worcester, Mass.

**Planing Machines**
American Tool Wks. Co., Cincinnati, Ohio.
Betts Machine Co., Rochester, N. Y.
Cincinnati Planer Co., Cincinnati, Ohio.
Cleveland Planer Co., Cleveland, Ohio.
Gray Co., G. A., Cincinnati, Ohio.
Hamilton Mach. Tool Co., Hamilton, Ohio.
Hill, Clarke & Co., 156 Oliver St., Boston, Mass.
Liberty Mach. Tool Co., Hamilton, Ohio.
Lynd Farquhar Co., Boston, Mass.
Newton Mach. Tool Wks., Philadelphia, Penn.
Niles-Bement-Pond Co., 111 Broadway, N. Y. C.
Ohio Mach. Tool Co., Kenton, Ohio.
Powell Machine Co., Worcester, Mass.
Prentiss & Co., Henry, Singer Bldg., N. Y. City.
Sellers & Co., Wm., Philadelphia, Penn.
Strong, Carlisle & Hammond Co., Cleveland, O.
Whitcomb-Blaisdell Mach. Tool Co., Worcester.

**Planing Machines, Rotary**
Niles-Bement-Pond Co., 111 Broadway, N. Y. C.
Underwood Corp., H. B., Philadelphia, Penn.

**Plate Rolls**
Niles-Bement-Pond Co., 111 Broadway, N. Y. C.

**Pneumatic Tools**
American Pneumatic Chuck Co., Chicago, Ill.
Anderson Bros. Mfg. Co., Rockford, Ill.
Baird Pneumatic Tool Co., Kansas City, Mo.
Chicago Pneumatic Tool Co., Chicago, Ill.
Cleveland Pneumatic Tool Co., Cleveland, Ohio.
Independent Pneumatic Tool Co., Chicago, Ill.
Ingersoll-Rand Co., 11 Bway, N. Y. City.

**Polishing and Buffing Machines**
Barnes Co., W. F. & John, Rockford, Ill.
Blanchard Mach. Co., Cambridge, Mass.
Bluney Machine Co., Greenfield, Mass.
Blount Co., J. G., Woodland St., Everett, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Bryant Chucking Grinder Co., Springfield, Vt.
Cutter & Wood Supply Co., Boston.
Diamond Mach. Co., Providence, R. I.
Fitchburg Grinding Mach. Co., Fitchburg, Mass.
Gardner Machine Co., Beloit, Wis.
Greenfield Mach. Co., Greenfield, Mass.
Greenfield Tap & Die Corp., Machy. Division, Greenfield, Mass.
Heald Mach. Co., Worcester, Mass.
Holtzer-Cabot Electric Co., Boston.
Independent Pneumatic Tool Co., Chicago, Ill.
Landis Tool Co., Waynesboro, Penn.
New Britain Mach. Co., New Britain, Conn.
Newton Mach. Tool Wks., Philadelphia, Penn.
Norton Co., Worcester, Mass.
Noble & Westbrook Mfg. Co., Hartford, Conn.
Potter Tool & Mach. Wks., 79 E. 130 St., N. Y.
Rivett Lathe & Grinder Co., Brighton, Boston
Rowbottom Mach. Co., Waterbury, Conn.
Royersford Fdry. & Mach. Co., Royersford, Pa.
Safety Emery Wheel Co., Springfield, Ohio.
Union Twist Drill Co., Athol, Mass.
U. S. Electrical Tool Co., Cincinnati, Ohio.
Universal Grinding Mach. Co., Fitchburg, Mass.
Van Dorn Electric Tool Co., Cleveland.
Van Norman Mach. Tool Co., Springfield, Mass.
Walker & Co., O. S., Worcester, Mass.
Wilmarth & Morman Co., Grand Rapids, Mich.
Wisconsin Electric Co., Racine, Wis.

**Pots, Steel**
Eclipse Fuel Engineering Co., Rockford, Ill.

**Pressed Steel Parts**
New Britain Mach. Co., New Britain, Conn.

**Presses, Arbor**
Atlas Press Co., Kalamazoo, Mich.
Barnes Co., W. F. & John, Rockford, Ill.
Geier Co., P. A., Cleveland, Ohio.
Metalwood Mfg. Co., Detroit, Mich.
Nicholson & Co., W. H., Wilkes-Barre, Pa.
Wilmarth & Morman Co., Grand Rapids, Mich.

**Presses, Banding**
Metalwood Mfg. Co., Detroit, Mich.

**Presses, Broaching**
Atlas Press Co., Kalamazoo, Mich.
Metalwood Mfg. Co., Detroit, Mich.

**Presses, Drop and Forging**
Ams Machine Co., Max, 101 Park Ave., N. Y. C.
Bliss Co., E. W., 1 Adams St., Brooklyn, N. Y.
Camden Forge Co., Camden, N. J.
Elmes Eng. Wks., Chas. F., Chicago, Ill.
Niles-Bement-Pond Co., 111 Bway., N. Y. City.
Toledo Mach. & Tool Co., Toledo, Ohio.

**Presses, Foot and Hand**
Atlas Press Co., Kalamazoo, Mich.
Bliss Co., E. W., 1 Adams St., Brooklyn, N. Y.
Ferracute Mach. Co., Bridgeton, N. J.
Shuster Co., F. B., New Haven, Conn.
Taylor & Fenn Co., Hartford, Conn.

**Presses, Forcing**
Ams Machine Co., Max, 101 Park Ave., N. Y. C.
Atlas Press Co., Kalamazoo, Mich.
Barnes Co., W. F. & John, Rockford, Ill.
Lucas Mach. Tool Co., Cleveland, Ohio.
Metalwood Mfg. Co., Detroit, Mich.

**Presses, Hydraulic**
Elmes Engineering Wks., Chas. F., Chicago.
Hydraulic Press Mfg. Co., Mt. Gilead, Ohio.
Metalwood Mfg. Co., Detroit, Mich.
Niles-Bement-Pond Co., 111 Bway., N. Y. City.
Watson-Stillman Co., 42 Church St., N. Y. City.

**Presses, Power**
Ams Machine Co., Max, 101 Park Ave., N. Y. C.
Barnes Co., W. F. & John, Rockford, Ill.
Blake & Johnson Co., Waterbury, Conn.
Bliss Co., E. W., 1 Adams St., Brooklyn, N. Y.
Ferracute Mach. Co., Bridgeton, N. J.
Niagara Mach. & Tool Wks., Buffalo, N. Y.
Rowbottom Mach. Co., Waterbury, Conn.
Toledo Mach. & Tool Co., Toledo, Ohio.
Stoll Co., Inc., D. H., Buffalo, N. Y.
V & O Press Co., Glendale, L. I., N. Y.

**Presses, Screw**
Barnes Co., W. F. & John, Rockford, Ill.
Bliss Co., E. W., 1 Adams St., Brooklyn, N. Y.
Manhattan Mach. & Tool Co., Grand Rapids, Mich.

**Profiling Machines**
Becker Milling Mach. Co., Hyde Park, Mass.
Cochrane-Bly Co., Rochester, N. Y.
Fischer Machine Co., Philadelphia, Pa.
Garvin Machine Co., N. Y. City.
Newton Mach. Tool Wks., Philadelphia, Penn.
Pratt & Whitney Co., Hartford, Conn.
Stark Tool Co., Waltham, Mass.
Wade-American Precision Tool Co., Boston.

**Publishers**
McGraw-Hill Book Co., 239 W. 39th St., N. Y. C.

**Pulley Turning and Boring Machines**
American Tool Wks. Co., Cincinnati, Ohio.
Cincinnati Pulley Machy. Co., Cincinnati, Ohio.
Niles-Bement-Pond Co., 111 Bway., N. Y. City.
Wilmarth & Morman Co., Grand Rapids, Mich.

**Pulleys, Cork Insert**
American Pulley Co., Philadelphia, Pa.

**Pulleys, Metal**
American Pulley Co., Philadelphia, Pa.
Brown Co., A. & F., 79 Barclay St., N. Y. City.
Brown & Sharpe Mfg. Co., Providence, R. I.
Caldwell & Son Co., H. W., Chicago, Ill.
Johnson Mach. Co., Carlyle, Manchester, Conn.
Transmission Ball Bearing Co., Buffalo, N. Y.
Wilmarth & Morman Co., Grand Rapids, Mich

**Pulleys, Paper**
Rockwood Mfg. Co., Indianapolis, Ind.

**Pumps, Hydraulic**
Elmes Engineering Wks., Chas. F., Chicago.
Hydraulic Press Mfg. Co., Mt. Gilead, Ohio.
Metalwood Mfg. Co., Detroit, Mich.
Wilmarth & Morman Co., Grand Rapids, Mich.
Worthington Pump & Mchy. Corp., N. Y. City

**Pumps, Lubricant and Oil**
Bowser & Co., S. F., Fort Wayne, Ind.
Brown & Sharpe Mfg. Co., Providence, R. I.
Fulflo Pump Co., Blanchester, Ohio.
Gilbert & Barker Mfg. Co., Springfield, Mass.
Hudson Pump Co., Jersey City, N. J.
Michigan Machine Co., Detroit, Mich.
Rothweiler & Co., Seattle, Wash.
Trahern Pump Co., Rockford, Ill.
Volyum Pump Co., 419 W. Liberty St., Cincinnati
Worthington Pump & Mchy. Corp., N. Y. City.

**Pumps, Power**
Bowser & Co., S. F., Fort Wayne, Ind.
Ingersoll-Rand Co., 11 Bway., N. Y. City.
Worthington Pump & Mchy. Corp., N. Y. City

**Punches, Center**
Brown & Sharpe Mfg. Co., Providence, R. I.
Starrett Co., L. S., Athol, Mass.
Union Tool Co., Orange, Mass.

**Punches, Hand**
Armstrong-Blum Mfg. Co. Chicago, Ill.

**Punches, Power**
Birdsboro Steel Fdry. & Mach. Co., Birdsboro, Pa
Ferracute Mach. Co., Bridgeton, N. J.
Prentiss & Co., Henry, Singer Bldg., N. Y. City
Royersford Fdry. & Mach. Co., Royersford, Pa
Watson-Stillman Co., 42 Church St., N. Y. City

**Pyrometers, Electric**
Bristol Co., Waterbury, Conn.
Brown Instrument Co., Philadelphia, Penn.
Englehard, Chas., 30 Church St., N. Y. City.
Taylor Instrument Cos., Rochester, N. Y.
Thwing Instrument Co., Philadelphia, Penn.

**Rack Cutting Machines**
Gould & Eberhardt, Newark, N. J.
Sloan & Chace Mfg. Co., Newark, N. J

**Racks, Cut**
Moltrup Steel Products Co., Beaver Falls, Pa.
Van Dorn & Dutton Co., Cleveland, Ohio.

**Racks, Storage (See Furniture, Machine Shop)**

**Radiators, Japanning Oven**
American Gas Furnace Co., 24 John St., N. Y. C
Chicago Flexible Shaft Co., Chicago, Ill.

**Rammers, Foundry**
Brown & Sharpe Mfg. Co., Providence, R. I.
Ingersoll-Rand Co., 11 Bway., N. Y. City.

**Rawhide, Rope**
Schieren Co., Chas. A., 41 Ferry St., N. Y. City

**Reamer Holders**
Gisholt Mach. Co., Madison, Wis.
Independent Pneumatic Tool Co., Chicago, Ill

**Reamers, Expanding**
Advance Tool Co., Cincinnati, Ohio.
Brubaker & Bros., W. L., 50 Church St., N.Y.C
Cashman Tool Co., Waynesboro, Pa.
Cleveland Twist Drill Co., Cleveland, Ohio.
Clough, R. M., Meriden, Conn.
Cutter & Wood Supply Co., Boston.
Detroit Twist Drill Co., 644 Fort St., Detroit.
Gisholt Mach. Co., Madison, Wis.
Greenfield Tap & Die Corp., Greenfield, Mass.
Hall Mfg. Co., Abington, Mass.
Keystone Reamer & Tool Co., Millersburg, Pa.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

**Reamers, Solid**
Advance Tool Co., Cincinnati, Ohio.
Bay State Tap & Die Co., Mansfield, Mass.
Brewster Co., Wm., 30 Church St., N. Y. City
Brubaker & Bros., W. L., 50 Church St., N.Y.C
Buckeye Twist Drill Co., Alliance, Ohio.
Butterfield & Co., Derby Line, Vt.
Clark Equipment Co., Buchanan, Mich.
Cleveland Twist Drill Co., Cleveland, Ohio.
Detroit Reamer & Tool Co., Detroit, Mich.
Detroit Twist Drill Co., 644 Fort St., Detroit.
Gale-Sawyer Co., 33 Wormwood St., Boston.
Greenfield Tap & Die Corp., Greenfield, Mass.
Kelly Reamer Co., Cleveland, Ohio.
Keystone Reamer & Tool Co., Millersburg, Pa.
Lincoln Twist Drill Co., The, Taunton, Mass.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Tool Co., Cleveland, Ohio.
Reed Mfg. Co., Erie, Pa.
Rich Tool Co., Railway Exchange, Chicago.
Skelton Tool Co., Syracuse, N. Y.
Standard Tool Co., Cleveland, Ohio.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Union Twist Drill Co., Athol, Mass.
Western Tool & Mfg. Co., Springfield, Ohio.

**Reamers, Taper**
Brown & Sharpe Mfg. Co., Providence, R. I.
Detroit Reamer & Tool Co., Detroit, Mich.
Greenfield Tap & Die Corp., Greenfield, Mass.
Keystone Reamer & Tool Co., Millersburg, Pa.
Lincoln Twist Drill Co., The, Taunton, Mass.

**Recorders, Pressure**
Bristol Co., Waterbury, Conn.
Brown Instrument Co., Philadelphia, Penn.

**Recorders, Temperature**
Bristol Co., Waterbury, Conn.
Taylor Instrument Cos., Rochester, N. Y.
Thwing Instrument Co., Philadelphia, Penn.

**Recorders, Time**
Calculagraph Co., 30 Church St., N. Y. City.
Gisholt Mach. Co., Madison, Wis.

**Resistance Material**
Driver-Harris Co., Harrison, N. J.

**Rheostats**
General Electric Co., Schenectady, N. Y.
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa

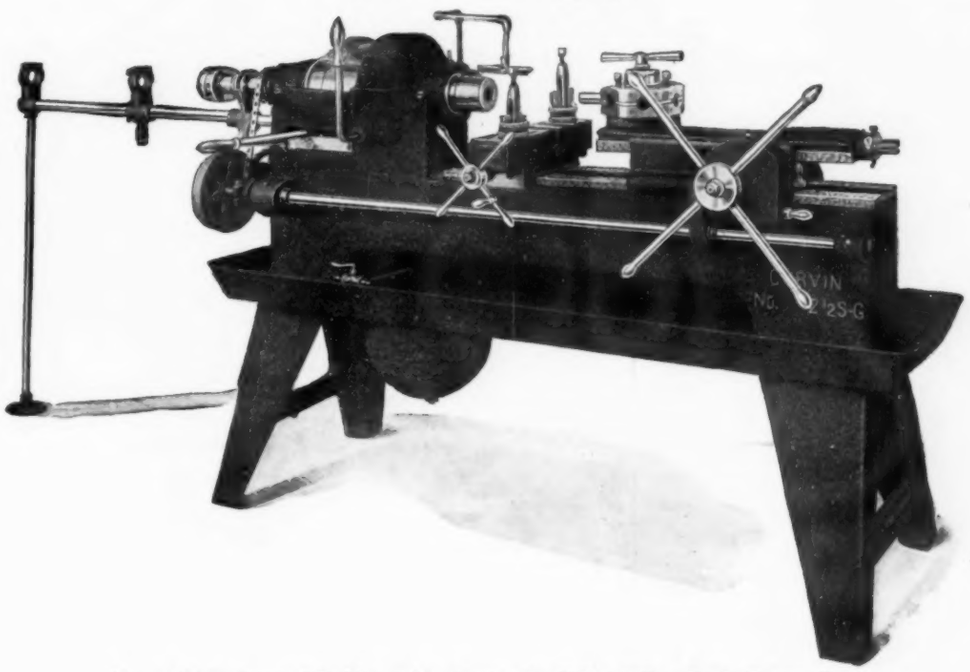
**Rivet Making Machinery**
Cook Co., Asa S., Hartford, Conn.
National Machinery Co., Tiffin, Ohio.

**Riveting Machines**
Bilton Mach. Tool Co., Bridgeport, Conn.
Birdsboro Steel F. & M. Co., Birdsboro, Penn.

# GARVIN

## No. 2½-SG. Screw Machine

### (New Design)




No. 2½-SG. Screw Machine with Automatic Collet, Wire Feed, Power Feed, Geared Friction Head and Pump and Piping

Capacity.....1 7/16x8½-in.
Use Code.....Byssus

This Solid-Head-Bed design is made from special tools. Spindles are hardened and ground and run in Bronze Boxes. Machines can be realigned under all conditions of wear. Turrets are made to revolve by hand in either direction. Machines furnished in various combinations and styles, the spot shown on main casting is for Screw Feed Side Motion Cross Slide.

Two Weeks' Delivery—
Send for Circular No. 223.

FOR FURTHER INFORMATION { ASK YOUR DEALER / OR WRITE US DIRECT

MANUFACTURED BY VISITORS WELCOME

## THE GARVIN MACHINE COMPANY

Spring and Varick Streets 50 Years in New York City

Grant Mfg. & Mach. Co., Bridgeport, Conn.
Independent Pneumatic Tool Co., Chicago, Ill.
Ingersoll-Rand Co., 11 Bway., N. Y. City.
Shuster Co., F. B., New Haven, Conn.
Thomson Spot Welder Co., Lynn, Mass.
Townsend Mfg. Co., H. P., Hartford, Conn.

**Rod Cutters**
Tucker, W. A. & C. F., Hartford, Conn.

**Rolling Mill Equipment**
Blake & Johnson Co., Waterbury, Conn.
Standard Eng'g. Wks., Ellwood City, Penn.
Sheffield Machine & Tool Co., Dayton, Ohio.
Sloan & Chace Mfg. Co., Newark, N. J.
Slocum, A'vram & Slocum Lab., Newark, N. J.

**Rules, Steel and Wood**
Brown & Sharpe Mfg. Co., Providence, R. I.
Hammacher, Schlemmer & Co., N. Y. City.
Starrett Co., L. S., Athol, Mass.
Union Tool Co., Orange, Mass.

**Rust Preventatives**
American Chemical Paint Co., N. Y. City
Oakley Chemical Co., 24 Thames St., N. Y. City.

**Sand-Blast Apparatus**
Hoevel Mfg. Corp., 50 Church St., N. Y. City.
Pangborn Corporation, Hagerstown, Md.
Paxson Co., J. W., Philadelphia, Penn.

**Sand Equipment**
Pangborn Corporation, Hagerstown, Md.

**Sanders**
Syracuse Sander Mfg. Co., Sander, N. Y. C.

**Sand Rammers, Pneumatic**
Cleveland Pneumatic Tool Co., Cleveland, Ohio.
Independent Pneumatic Tool Co., Chicago, Ill.

**Saw Frames and Blades, Hack**
American Saw & Mfg. Co., Springfield, Mass.
Atkins & Co., E. C., Indianapolis, Ind.
Diamond Saw & Stamping Wks., Buffalo, N. Y.
Hammacher, Schlemmer & Co., N. Y. City.
Racine Tool & Mach. Co., Racine, Wis.
Simonds Mfg. Co., Fitchburg, Mass.
Smith & Hemenway, 263 B'way, N. Y. City.
Starrett Co., L. S., Athol, Mass.
Thompson & Son Co., Hy. G., New Haven, Conn.
Union Tool Co., Orange, Mass.
Victor Saw Works, Springfield, Mass.
West Haven Mfg. Co., New Haven, Conn.

**Sawing Machines, Metal**
Armstrong-Blum Mfg. Co., Chicago, Ill.
Atkins & Co., E. C., Indianapolis, Ind.
Birdsboro Steel Fdry. & Mach. Co., Birdsboro, Pa.
Cochrane-Bly Co., Rochester, N. Y.
Diamond Saw & Stamping Wks., Buffalo, N. Y.
Eagle Gear & Mach. Co., Philadelphia, Penn.
Greenfield Tap & Die Corp., Machy. Division, Greenfield, Mass.
Newton Mach. Tool Wks., Philadelphia, Penn.
PeerlessMach. Co., Racine, Wis.
Racine Tool & Mach. Co., Racine, Wis.
Swind Machinery Co., Philadelphia, Pa.
Vandyck Churchill Co., 93 Liberty St., N. Y. C.
Victor Saw Wks., Springfield, Mass.

**Sawing Machines, Power Hack**
Armstrong-Blum Mfg. Co., Chicago, Ill.
Atkins & Co., E. C., Indianapolis, Ind.
Diamond Saw & Stamping Wks., Buffalo, N. Y.
Peerless Mach. Co., Racine, Wis.
Racine Tool & Mach. Co., Racine, Wis.
Thompson & Son Co., Hy. G., New Haven, Conn.
Victor Saw Wks., Springfield, Mass.
West Haven Mfg. Co., New Haven, Conn.
Western Tool & Mfg. Co., Springfield, Mass.

**Saw Sharpening Machines**
Cochrane-Bly Co., Rochester, N. Y.
Greenfield Tap & Die Corp., Machy. Division, Greenfield, Mass.
Hunter Saw & Mach. Co., Pittsburgh, Penn.

**Saws, Circular Metal**
Atkins & Co., E. C., Indianapolis, Ind.
Barber-Coleman Co., Rockford, Ill.
Cochrane-Bly Co., Rochester, N. Y.
Hunter Saw & Machine Co., Pittsburgh, Penn.
Lincoln Twist Drill Co., Taunton, Mass.
Pratt & Whitney Co., Hartford, Conn.
Simonds Mfg. Co., Fitchburg, Mass.
Union Twist Drill Co., Athol, Mass.

**Saws, Hand**
Reliance Steel & Tool Co., 24 Murray St., N. Y.

**Saws, Metal Band**
American Saw & Mfg Co., Springfield, Mass.
Atkins & Co., E. C., Indianapolis, Ind.
Garvin Machine Co., N. Y. City.
Hunter Saw & Mach. Co., Pittsburgh, Penn.
Racine Tool & Mach. Co., Racine, Wis.
Silver Mfg. Co., Salem, Ohio.
Simonds Mfg. Co., Fitchburg, Mass.

**Saws, Metal Cutting**
Brown & Sharpe Mfg. Co., Providence, R. I.
Cochrane-Bly Co., Rochester, N. Y.
Hunter Saw & Mach. Co., Pittsburgh, Penn.
Reliance Steel & Tool Co., 24 Murray St., N. Y.

**Saws, Milling**
Brown & Sharpe Mfg. Co., Providence, R. I.
Lincoln Twist Drill Co., Taunton, Mass.

**Saws, Screw Slotting**
Atkins & Co., E. C., Indianapolis, Ind.
Brown & Sharpe Mfg. Co., Providence, R. I.
Lincoln Twist Drill Co., Taunton, Mass.
Pratt & Whitney Co., Hartford, Conn.
Reliance Steel & Tool Co., 24 Murray St., N. Y
Simonds Mfg. Co., Fitchburg, Mass.
Starrett Co., L. S., Athol, Mass.
Union Twist Drill Co., Athol, Mass.

**Saw Tables, Universal**
Baker Bros., Toledo, Ohio.
Silver Mfg. Co., Salem, Ohio.

**Scales**
Brown & Sharpe Mfg. Co., Providence, R. I.

**Scraping Tables**
New Britain Machine Co., New Britain, Conn.

**Screw Driving Machines**
Reynolds Machine Co., Massillon, Ohio.

**Screw Machine Racks**
New Britain Machine Co., New Britain, Conn.

**Screw-Machine Work**
Ansonia Mfg. Co., Ansonia, Conn.
Atlantic Mfg. Co., Milford, Conn.
Brown Engineering Co., Reading, Pa.
Cincinnati Automatic Mach. Co., Cincinnati, O.
Corbin Screw Corp., New Britain, Conn.
Dallett Co., Thos. H., Philadelphia, Penn.
Eastern Mach. Screw Corp., New Haven, Conn.
Ericsson Screw Mach. Products Co., Brooklyn.
Hartford Machine Screw Co., Hartford, Conn.
Link-Belt Co., Philadelphia, Chicago.
Meisel Press Co., 946 Dorchester Ave., Boston.
National Acme Co., Cleveland, Ohio.
National Mach. Tool Co., Cincinnati, Ohio.
New Britain Machine Co., New Britain, Conn.
Spafford Tool Wks., Hartford, Conn.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Tock Screw Mach. Products Corp., L. I. City.
Union Tool Co., Orange, Mass.
Whiting & Comstock, Hartford, Conn.
Worcester Machine Screw Co., Worcester, Mass.
Zumbach Machine Co., 134 W. 54th St., N. Y. C.

**Screw Machy., Wood and Lag**
Cook Co., Asa S., Hartford, Conn.
Townsend Mfg. Co., H. P., Hartford, Conn.

**Screw Machines, Automatic**
Brown & Sharpe Mfg. Co., Providence, R.I.
Cincinnati Automatic Mach. Co., Cincinnati, O.
Cleveland Automatic Mach. Co., Cleveland, Ohio.
Cone Automatic Machine Co., Windsor, Vt.
Davenport Mach. Tool Co., New Bedford, Mass.
Hartford Machine Screw Co., Hartford, Conn.
National Acme Co., Cleveland, Ohio.
New Britain Mach. Co., New Britain, Conn.
P. W. V. Auto Machine Corp., Fitchburg, Mass.
Reynolds Machine Co., Massillon, Ohio.
Townsend Mfg. Co., H. P., Hartford, Conn.

**Screw Machines, Plain or Hand**
Acme Mach. Tool Co., Cincinnati, Ohio.
Brown & Sharpe Mfg. Co., Providence, R. I.
Dreses Mach. Tool Co., Cincinnati, O.
Foster Mach. Co., Elkhart, Ind.
Garvin Mach. Co., Spring & Varick Sts., N. Y. C.
Greenfield Tap & Die Corp., Machy. Division, Greenfield, Mass.
Jones & Lamson Mach Co., Springfield, Vt.
Millholland Mach Co., W. K., Indianapolis, Ind.
Oliver Machinery Co., Grand Rapids, Mich.
Warner & Swasey Co., Cleveland, Ohio.
Wood Turret Mach. Co., Brazil, Ind.

**Screw Plates**
Bay State Tap & Die Co., Mansfield, Mass.
Brubaker & Bros., W. L., 50 Church St., N.Y.C.
Butterfield & Co., Derby Line, Vt.
Card Mfg. Co., S. W., Mansfield, Mass.
Gardner-Bryan Co., Cleveland, O.
Greenfield Tap & Die Corp., Greenfield, Mass.
Morse Twist Drill & Mch. Co., New Bedford, Mass.

**Screws, Cap and Set**
Allen Mfg. Co., 135 Sheldon St., Hartford, Conn.
Bristol Co., Waterbury, Conn.
Hartford Machine Screw Co., Hartford, Conn.
Hammacher, Schlemmer & Co., N. Y. City.
National Acme Co., Cleveland, Ohio.
Strong, Carlisle & Hammond Co., Cleveland, O.
Worcester Machine Screw Co., Worcester, Mass.

**Screws, Lead**
Alling-Lander Co., Sodus, N. Y.

**Screws, Machine**
Allen Mfg. Co., 135 Sheldon St., Hartford, Conn.
Bristol Co., Waterbury, Conn.
Hammacher, Schlemmer & Co., N. Y. City.
Worcester Machine Screw Co., Worcester, Mass.

**Screws, Safety Set**
Allen Mfg. Co., 135 Sheldon St., Hartford, Conn.
Bristol Co., Waterbury, Conn.
Hartford Machine Screw Co., Hartford, Conn.
Hammacher, Schlemmer & Co., N. Y. City.
Strong, Carlisle & Hammond Co., Cleveland, O.

**Seamless Steel Tubing (See Tubing, Seamless Steel)**

**Second-Hand Machinery (See Searchlight Section)**
Aetna Machinery Corp., Newark, N. J.
American Machinery Exchange, N. Y. C.
Badger-Packard Machinery Co., Milwaukee.
Baird Machine Co., W. J., Detroit, Mich.
Barbour, Love & Woodward, N. Y. City.
Bath & Co., Cyril J., Cleveland, Ohio.
Bennett Machy. Co., G. L., 30 Church St., N. Y.
Bertolette Machine Tool Co., Jersey City, N. J.
Broadway Machinery Co., Cincinnati, Ohio.
Brownell Machinery Co., Providence, R. I.
Calumet Iron & Metal Co., Chicago, Ill.
Cincinnati Planer Co., Cincinnati, Ohio.
Dale Brewster Machinery Co., Chicago, Ill.
Day Machinery Co., Buffalo, N. Y.
Dennett, George, 237 Centre St., N. Y City.
Du Pont Chemical Co., Wilmington, Del.
Eastern Machinery Co., Cincinnati, Ohio.
Factory & Mill Supply Co., Boston, Mass.
Fales Machinery Co., C. E., Detroit.
Federal Machinery Sales Co., Chicago, Ill.
Garvin Machine Co., N. Y. City.
Gelb & Co., J., 201 Centre St., N. Y. City.
Green Rail & Supply Co., L. A., Pittsburgh.
Harris Bros. Co., 35th & Iron Sts., Chicago.
Hill, Clarke & Co., 156 Oliver St., Boston, Mass.
Hill Clarke & Co., of Chicago, Chicago, Ill.
Ideal Machinery Co., Plainsville, Conn.
Industrial Machy. Corp., Jersey City, N. J.
Kinsey Co., E. A., Cincinnati, Ohio.
Lamberg & Co., A., N. Y. City.
Lynd-Farquhar Co., 419 Atlantic Ave., Boston.
McMullen Machinery Co., Grand Rapids, Mich.
Modern Machinery Exchange, N. Y. City.
Marshall & Huschart Machy. Co., Chicago.
Morey & Co., 50 Church St., New York City.
Morris Mchy. Co., 93 Chestnut St., Newark, N. J.
Morton Machinery Co., 139 3d St., Phila.
Motch & Merryweather Mchy. Co., Cleveland.
New York Mchy. Ex., 50 Church St., N. Y.
Niles-Bement-Pond Co., 111 Bway., N. Y. City.
Osborne & Sexton Machy. Co., Columbus, Ohio.
Prentiss & Co., Henry, Singer Bldg., N. Y. City.
Richards, Anson W., 802 Singer Bldg., N. Y. C.
Russell Machine Co., Pittsburgh, Pa.
Schoonmaker & Sons, A. G., N. Y. City.
Simmons Mach. Co., Inc., 149 B'way, N. Y. City
Standard Machine Tool Co., Columbus, Ohio.
Stickley Mach. Co., E. B., Detroit, Mich.
Stocker-Rumely-Wachs Co., Chicago.
Toomey, Frank, 127 N. 3rd St., Philadelphia, Pa.
Vonnegut Machinery Co., Indianapolis, Ind.
Walsh Machinery Co., M. J., Milwaukee, Wis.
Wayne Machinery Co., Fort Wayne, Ind.
Westinghouse Elec. & Mfg. Co., Pittsburgh, Pa.
Wickes Machinery Co., Jersey City, N. J.
Winterer, Herman L., Philadelphia, Penn.
Zelnicker Supply Co., Walter A., St. Louis, Mo.

**Separators, Moisture and Oil**
Pangborn Corporation, Hagerstown, Md.

**Separators, Oil and Waste**
Oil & Waste Saving Mach. Co., Philadelphia, Pa.

**Set-up Equipment**
Standard Shop Equipment, Philadelphia, Pa.

**Shafting**
Aborn Steel Co., 22 Clarke St., N. Y. City.
Camden Forge Co., Camden, N. J.
Columbia Steel & Shafting Co., Pittsburgh, Penn.
Royersford Fdry. & Mach. Co., Royersford, Pa.
Union Drawn Steel Co., Beaver Falls, Penn.

**Shafts, Crank and Jack**
Camden Forge Co., Camden, N. J.
Standard Gauge Steel Co., Beaver Falls, Penn.

**Shapes, Cold-Drawn Special Steel**
Columbia Steel & Shafting Co., Pittsburgh, Pa.
Moltrup Steel Products Co, Beaver Falls, Pa.
New England Drawn Steel Co., Mansfield, Mass.
Union Drawn Steel Co., Beaver Falls, Penn.

**Shaping Machines**
American Tool Works Co., Cincinnati, Ohio.
Cincinnati Shaper Co., Cincinnati, Ohio.
Cochrane-Bly Co., Rochester, N. Y.
Columbia Mach. Tool Co., Hamilton, Ohio.
Davis Machine Tool Co., Rochester, N. Y.
Gould & Eberhardt, Newark, N. J.
Hendey Mach. Co., Torrington, Conn.
Kelly Co., R. A., Box 488 Xenia, O.
Lynd-Farquhar Co., Boston, Mass.
Morton Mfg. Co., Muskegon Heights, Mich.
Newton Mach. Tool Wks., Philadelphia, Penn.
Niles-Bement-Pond Co., 111 Bway., N. Y. City.
Oakley Mach. Tool Co., Cincinnati, Ohio.
Ohio Mach. Tool Co., Kenton, Ohio.
Potter & Johnston Mach. Co., Pawtucket, R. I.
Prentiss & Co., Henry, Singer Bldg., N. Y. City.
Rhodes Mfg. Co., Hartford, Conn.
Sellew Machine Tool Co., Pawtucket, R. I.
Smith & Mills Co., Cincinnati, Ohio.
Springfield Mach. Tool Co., Springfield, Ohio.
Steptoe Co., John, Northside, Cincinnati, Ohio.
Stockbridge Machine Co., Worcester, Mass.
Strong, Carlisle & Hammond Co., Cleveland, O.

**Shears, Hand**
Armstrong-Blum Mfg. Co., Chicago, Ill.
Oliver Mfg. Co., W. W., Buffalo, N. Y.
Tucker, W. A. & C. F., Hartford, Conn.

**Shears, Power**
Birdsboro Steel F. & M. Co., Birdsboro, Pa.
Ferracute Mach. Co., Bridgeton, N. J.
Niagara Mach. & Tool Wks., Buffalo, N. Y.
Royersford Fdry. & Mach. Co., Royersford, Pa.
Stoll Co., D. H., Buffalo, N. Y.
Toledo Mach. & Tool Co., Toledo, Ohio.

**Sheet Metal Working Machinery**
Ams Machine Co., Max., 101 Park Ave., N. Y. C.
Ferracute Mach. Co., Bridgeton, N. J.
Niagara Mach. & Tool Works, Buffalo, N. Y.
Savage Co., W. J., Knoxville, Tenn.
Toledo Mach. & Tool Co., Toledo, Mich.

**Shelving, Steel (See Furniture, Machine Shop)**

**Shims**
Laminated Shim Co., 533 Canal St., N. Y. C.

**Slotting Machines**
Betts Machine Co., Rochester, N. Y.
Cochrane-Bly Co., Rochester, N. Y.
Dill Machine Co., T. C., Philadelphia, Pa.
Garvin Mach. Co., N. Y. City.
Newton Machine Tool Wks., Philadelphia, Penn
Sellers & Co., Wm., Philadelphia, Penn.

**Sockets and Sleeves**
Clark Equipment Co., Buchanan, Mich.
Cleveland Twist Drill Co., Cleveland, Ohio.
Detroit Twist Drill Co., 644 Fort St., Detroit.
Lincoln Twist Drill Co., Taunton, Mass.
Pratt & Whitney Co., Hartford, Conn.
Standard Tool Co., Cleveland, Ohio.

**Special Machinery and Tools**
American Pneumatic Chuck Co., Chicago, Ill.
Arrow Tool Co., Bridgeport, Conn.
Becker Milling Mach. Co., Hyde Park, Mass.
Betts Machine Co., Rochester, N. Y.
Bicknell-Thomas Co., Greenfield, Mass.
Bilgram Mach. Wks., Philadelphia, Penn.
Blake & Johnson Co., Waterbury, Conn.
Boston Scale & Mach. Co., Boston, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Coats Mach. Tool Co., 108-112 W. 40th St., N.Y.C.
Columbus Die Tool & Mach. Co., Columbus, O.
Cowdrey Mach. Wks., C. H., Fitchburg, Mass.
Davis-Bournonville Co., Jersey City, N. J.
Dexter I. H. Co., 27 Walker St., N. Y. C.
Earle Gear & Mach. Co., Philadelphia, Pa.
Federal Products Corp., Providence, R. I.
Feeney Tool Co., Bridgeport, Conn.
Fischer Machine Co., Philadelphia, Pa.
Franklin Machine Works, Providence, R. I.
Garvin Machine Co., N. Y. City.
Gem City Machine Co., Dayton, Ohio.
Gisholt Mach. Co., Madison, Wis.
Greenfield Tap & Die Corp., Greenfield, Mass.
Grover File Co., Nashua, N. H.
Hartford Special Mchy. Co., Hartford, Conn.
Hoefer Mfg. Co., Freeport, Ill.
Krasberg Eng. & Mfg. Corp., Chicago, Ill.
Lambert & Todd Mach. Co., Camden, N. J.
Langelier Mfg. Co., Arlington, Cranston, R. I.
Lincoln Machine Co., Pawtucket, R. I.
Marvin & Casler Co., Canastota, N. Y.
Marvin Mfg. Co., W. B., Urbana, Ohio.
Mehl Machine Tool & Die Co., Roselle, N. J
Meisel Press Mfg. Co., Boston, Mass.
Nazel Engineering & Machine Wks., Philadelphia.
Nelson Tool & Machine Co., Newark, N. J.

# NOVO SUPERIOR

## 40% Off H. S. Steel Costs

That's a big item in the course of the year. And you can do it by using Patent Sections in place of solid bar H. S. steel. Patent Sections weigh less, they are stronger, there is no waste, and no forging to add to your original cost. Better try them!

*You buy high-speed steel by weight.*

Saves 40% in weight.

Saves 35% in weight.

| SECTION I | SIZES IN STOCK | SECTION Z |
|---|---|---|
| ⅜ x ¾ | | ⅜ x ¾ |
| ½ x 1 | | ½ x 1 |
| ⅝ x 1¼ | | ⅝ x 1¼ |
| ¾ x 1½ | | ¾ x 1½ |
| | | 1 x 2 |

Of course we can also give you from stock solid flats, rounds, and squares when you need them.

*"The High-Speed Steel Without An Equal"*

H. BOKER & CO., Inc.

Established 1837

101 Duane Street, New York City

Chicago Detroit Boston Cleveland Philadelphia Montreal

Pacific Coast Representatives:

Berger & Carter Co., 400 Mission St., San Francisco, Calif.

Whiton Hdw. Co., 104 First Ave., So., Seattle, Washington.

Newton Machine Tool Works, Philadelphia, Penn
Oxweld Acetylene Co., Chicago, Ill.
Parker Mach. Co., 221 High St., Boston.
Peerless Machine Co., Racine, Wis.
Porter-Cable Machine Co., Syracuse, N. Y.
Reid Brothers Co., Beverly, Mass.
Reynolds Machine Co., Massillon, Ohio.
Robbins, Gamwell & Co., Pittsfield, Mass.
Rogers Machine Tool Co., Alfred, N. Y.
Rowbottom Machine Co., Waterbury, Conn.
Service Engineering Co., N. Y. City.
Slocum, Avram & Slocum Lab., Newark, N. J.
Steel Products Engineering Co., Springfield, O.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Terkelsen & Wennberg, Boston, Mass.
Underwood Corp., H. B., Philadelphia, Pa.
Wade-American Precision Tool Co., Boston.
Waltham Mach. Wks., High St., Waltham, Mass.
West & Dodge Co., Boston, Mass.
Whiting & Comstock, Hartford, Conn.
Wilcox Motor & Mfg. Co., Saginaw, Mich.

**Springs**
Cook & Co., Chas. A., Brooklyn, N. Y.

**Sprockets and Chains**
Baldwin Chain & Mfg. Co., Worcester, Mass.
Bilgram Mach. Works, Philadelphia, Pa.
Boston Gear Wks., Norfolk Downs, Quincy, Mass.
Caldwell & Son Co., H. W., Chicago, Ill.
Cullman Wheel Co., 1349 Altgeld St., Chicago
Grant Gear Works, 151 Pearl St., Boston, Mass.
Link-Belt Co., Chicago, Philadelphia.
Meisel Press Co., 946 Dorchester Ave., Boston.
Morse Chain Co., Ithaca, N. Y.
Philadelphia Gear Works, Philadelphia, Pa.
Whitney Mfg. Co., Hartford, Conn.

**Squares**
Brown & Sharpe Mfg. Co., Providence, R. I.
Starrett Co., L. S., Athol, Mass.

**Stampings, Metal**
American Pulley Co., Philadelphia, Pa.
Bay State Stamping Co., Worcester, Mass.
Blum & Co., Julius, 510-512 W. 24th St., N. Y. C.
Cook & Co., Chas. A., Brooklyn, N. Y.
Detroit Stamping Co., 951 W. Fort St., Detroit.
Cem Mfg. Co., Pittsburgh, Pa.
Kales Stamping Co., Detroit, Mich.
Krasberg Eng. & Mfg. Corp., Chicago, Ill.
New Britain Mach. Co., New Britain, Conn.
Root Co., C. J., Bristol, Conn.
Toledo Bridge & Crane Co., Toledo, Ohio.

**Stamps, Steel**
Hoggson & Pettis Mfg. Co., New Haven, Conn.
Noble & Westbrook Mfg. Co., Hartford, Conn.
Pannier Bros. Stamp Co., Pittsburgh, Pa.

**Stanchions, Machine Guard & Guard Rail**
New Britain Machine Co., New Britain, Conn.

**Stands, Portable (See Furniture, Machine Shop)**

**Steam Specialties**
Dart Mfg. Co., E. M., Providence, R. I.
Eclipse Fuel Engineering Co., Rockford, Ill.

**Steel, Cold Rolled Strip**
Blum & Co., Julius, 510-512 W. 24th St., N. Y. C.
Cyclops Steel Co., 120 Broadway, N. Y. City.
Hawkridge Bros. Co., 303 Congress St., Boston.

**Steel Hardness Measuring Instruments**
Short Instrument & Mfg. Co., N. Y. C.

**Steel Scrap Reclamation**
Onondaga Steel Co., Inc., Syracuse, N. Y

**Steel, Shafting and Free Cutting Screw**
Aborn Steel Co., 22 Clarke St., New York City.
Blum & Co., Julius, 510-512 W. 24th St., N. Y. C.
Columbia Steel & Shafting Co., Pittsburgh, Pa.
Cyclops Steel Co., 120 Broadway, New York City.
Hawkridge Bros. Co., 303 Congress St., Boston.
Moltrup Steel Products Co., Beaver Falls, Pa.
New England Drawn Steel Co., Mansfield, Mass
Union Drawn Steel Co., Beaver Falls, Pa.

**Steel, Sheet**
Aborn Steel Co., 22 Clarke St., New York City.
Boker & Co., H., 101 Duane St., N. Y. City.
Colonial Steel Co., Pittsburgh, Pa.
Hawkridge Bros. Co., 303 Congress St., Boston.
Jessop & Sons, Wm., 91 John St., New York City.
Ward's Sons, Edgar T., Boston, Mass.

**Steels, Alloy and Carbon**
Aborn Steel Co., 22 Clarke St., New York City
Boker & Co., H., 101 Duane St., New York City.
Carnegie Steel Co., Pittsburgh, Pa.
Cleveland Twist Drill Co., Cleveland, Ohio.
Cyclops Steel Co., 120 Broadway, New York City.
Federal Tool & Alloy Steel Corp., 12 Platt St., N.Y.
Firth-Sterling Steel Co., McKeesport, Pa.
Halcomb Steel Co., Syracuse, N. Y.
Hawkridge Bros. Co., 303 Congress St., Boston.
Hess Steel Corp., Baltimore, Md.
Jessop & Sons, Wm., 91 John St., N. Y. City.
Latrobe Elec. Steel Co., Latrobe, Pa.
Ludlum Steel Co., Watervliet, N. Y.
Midvale Steel & Ordnance Co., Phila., Pa.
Onondaga Steel Co., Inc., Syracuse, N. Y.
Vanadium Alloys Steel Co., Pittsburgh, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.
Ward's Sons, Edgar T., Boston, Mass.
Western Tool & Mfg. Co., Springfield, Ohio.
Williams & Co., J. H., Brooklyn, N. Y.

**Steels, High-Speed**
Aborn Steel Co., 22 Clarke St., New York City
Armstrong Bros. Tool Co., Chicago, Ill.
Atlas Crucible Steel Co., Dunkirk, N. Y.
Boker & Co., H., 101 Duane St., New York City.
Cleveland Twist Drill Co., Cleveland, Ohio.
Colonial Steel Co., Pittsburgh, Pa.
Cyclops Steel Co., 120 Broadway, New York City.
Firth-Sterling Steel Co., McKeesport, Pa
Halcomb Steel Co., Syracuse, N. Y.
Hawkridge Bros. Co., 303 Congress St., Boston.
Hess Steel Corp., Baltimore, Md.
Jessop & Sons, Wm., 91 John St., N. Y. City.
Latrobe Elec. Steel Co., Latrobe, Pa.
Ludlum Steel Co., Watervliet, N. Y.
Midvale Steel & Ordnance Co., Phila., Pa.
Onondaga Steel Co., Inc., Syracuse, N. Y.
Vanadium Alloys Steel Co., Pittsburgh, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.
Ward's Sons, Edgar T., Boston, Mass.
Williams & Co., J. H., Brooklyn, N. Y.

**Stools, Shop**
Manufacturing Equipment & Engineering Co., Framingham, Mass.
New Britain Mach. Co., New Britain, Conn.

**Straightening Machinery**
Shuster Co., F. B., New Haven, Conn.
Springfield Mach. Tool Co., Springfield, Ohio.
Standard Engineering Works, Pawtucket, R. I.

**Stud Setters, Opening**
Errington, F. A., 41 Cortlandt St., N. Y. City.

**Subpresses and Dies**
Waltham Mach. Wks., High St., Waltham, Mass.

**Supplies, Factory and Mill**
Hammacher, Schlemmer & Co., New York City

**Swaging Machines**
Langelier Mfg. Co., Arlington, Cranston, R. I.
Torrington Co., Excelsior Plant, Torrington, Ct.

**Switches and Switchboards**
General Electric Co., Schenectady, N. Y.
Westinghouse Elec. & Mfg. Co., E., Pittsburgh, Pa.

**Tachometers**
Bristol Co., Waterbury, Conn.
Brown Instrument Co., Philadelphia, Pa.
Jones-Motrola, Inc., 29 W. 35th St., N. Y. City.

**Tanks & Pumps, Oil**
Bowser & Co., Inc., S. F., Fort Wayne, Ind.
Gilbert & Barker Mfg. Co., Springfield, Mass

**Tap Extensions**
Allen Mfg. Co., 135 Sheldon St., Hartford, Conn.

**Tap Holder**
Bay State Tap & Die Co., Mansfield, Mass.
Bicknell-Thomas Co., Greenfield, Mass.
Errington, F. A., 41 Cortlandt St., N. Y. City.
Gisholt Mach. Co., Madison, Wis.
Greenfield Tap & Die Corp., Greenfield, Mass.

**Taper Pins**
Brown & Sharpe Mfg. Co., Providence, R. I.
Pratt & Whitney Co., Hartford, Conn.
Standard Tool Co., Cleveland, Ohio.

**Tapes, Measuring**
Starrett Co., L. S., Athol, Mass.

**Tapping Machines and Attachments**
Acme Machinery Co., Cleveland, Ohio.
American Tool Works Co., Cincinnati, Ohio.
Baker Bros., Toledo, Ohio.
Beaman & Smith Co., Providence, R. I.
Bicknell-Thomas Co., Greenfield, Mass
Burke Machine Tool Co., Conneaut, Ohio.
Carlton Mach. Tool Co., Cincinnati, Ohio.
Cincinnati Bickford Tool Co., Cincinnati, Ohio.
Gorman & Sons, John H., 1 Bethune St., N. Y.
Errington, F. A., 41 Cortlandt St., N. Y. City.
Evans Stamping & Plating Co., Taunton, Mass.
Garvin Mach. Co., Spring and Varick St., N. Y. C.
Geometric Tool Co., New Haven, Conn.
Greenfield Tap & Die Corp., Greenfield, Mass.
Harrington, Son & Co., Edwin, Philadelphia, Pa.
Hoefer Mfg. Co., Freeport, Ill.
Langelier Mfg. Co., Arlington, Cranston, R. I.
Moline Tool Co., Moline, Ill.
National Machy. Co., Tiffin, Ohio.
Rickert-Shafer Co., Erie, Pa.
Sloan & Chace Mfg. Co., Newark, N. J.
Turner Machine Co., Danbury, Conn.

**Taps and Dies**
Advance Tool Co., Cincinnati, Ohio.
Bay State Tap & Die Co., Mansfield, Mass.
Bignall & Keeler Mach. Works, Edwardsville, Ill.
Brubaker & Bros., W. L., 50 Church St., N.Y.C.
Butterfield & Co., Derby Line, Vt.
Card Mfg. Co., S. W., Mansfield, Mass.
Gardner-Bryan Co., Cleveland, O.
Greenfield Tap & Die Corp., Greenfield, Mass.
Hammacher, Schlemmer & Co., New York City.
Landis Mach. Co., Waynesboro, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Murchey Mach. & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
National Tool Co., Cleveland, Ohio.
Pratt & Whitney, Hartford, Conn.
Reed Mfg. Co., Erie, Pa.
Saunders Sons, D., Yonkers, N. Y.
Standard Tool Co., Cleveland, Ohio.
Winter Bros. Co., Wrentham, Mass.

**Taps, Collapsing**
Errington, F. A., 41 Cortlandt St., N. Y.
Geometric Tool Co., New Haven, Conn.
Murchey Mach. & Tool Co., Detroit, Mich.
Victor Tool Co., Waynesboro, Pa.

**Testing Metals and Materials**
Souther Eng'r. Corp., N. Y., Hartford, Conn.

**Thermometers**
Bristol Co., Waterbury, Conn.
Brown Instrument Co., Philadelphia, Pa.
Eclipse Fuel Engineering Co., Rockford, Ill.
Englehard, Charles, 30 Church St., N. Y. City.
Taylor Instrument Cos., Rochester, N. Y.
Thwing Instrument Co., Philadelphia Pa.

**Thread-Cutting Tools**
Eastern Machine Screw Corp., New Haven, Conn.
Federal Products Corp., Providence, R. I.
Geometric Tool Co., New Haven, Conn.
Greenfield Tap & Die Corp., Greenfield, Mass.
Jones & Lamson Mach. Co., Springfield, Vt.
Krasberg Eng. & Mfg. Corp., Chicago, Ill.
Landis Mach. Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Murchey Mach. & Tool Co., Detroit, Mich.
Parker Machine Co., 221 High St., Boston
Pratt & Whitney Co., Hartford, Conn.
Rivett Lathe & Grinder Co., Brighton, Boston.
Union Tool Co., Orange, Mass.
Williams & Co., J. H., Brooklyn, N. Y.

**Threading Machines**
Automatic Mach. Co., Bridgeport, Conn.
Eastern Machine Screw Corp., New Haven, Conn.
Geometric Tool Co., New Haven, Conn.
Greenfield Tap & Die Corp., Greenfield, Mass.
Landis Mach. Co., Waynesboro, Pa.
National Acme Co., Cleveland, Ohio.
National Machy. Co., Tiffin, Ohio.
Universal Machine Co., Bowling Green, Ohio.

**Thread Lead Testing Machinery**
Arrow Tool Co., Bridgeport, Conn.
Bicknell-Thomas Co., Greenfield, Mass.
West & Dodge Co., Boston, Mass.

**Thread Rolling Machines**
National Machy. Co., Tiffin, Ohio.

**Tongs**
Moore Drop Forging Co., Springfield, Mass.

**Tool Cases**
Gerstner & Sons, H., 22 Columbia St., Dayton, O.
Waterston, J. M., 77 Woodward Ave., Detroit.

**Tool Holders**
Armstrong Bros., Tool Co., Chicago, Ill.
Bay State Tap & Die Co., Mansfield, Mass.
Clark Equipment Co., Buchanan, Mich.
Economy Tool Holder Co., 103 Park Ave., N. Y.
Federal Products Corp., Providence, R. I.
Gisholt Mach. Co., Madison, Wis.
Lovejoy Tool Co., Springfield, Vt.
Parker Mach. Co., 221 High St., Boston.
Pratt & Whitney Co., Hartford, Conn.
Union Tool Co., Orange, Mass.
Western Tool & Mfg. Co., Springfield, Ohio.
Williams & Co., J. H., 35 Richards St., Brooklyn.

**Tool Marking, Electric**
Brewster Co., Wm., 30 Church St., N. Y. City.

**Tool Posts, Lathe**
Armstrong Bros. Tool Co., Chicago, Ill.

**Tool Work**
Advance Tool Co., Cincinnati, Ohio.
American Tool & Mfg. Co., Urbana, Ohio.
Ames Co., B. C., Waltham, Mass.
Arrow Tool Co., Bridgeport, Conn.
Becker Milling Mach. Co., Hyde Park, Mass.
Bicknell-Thomas Co., Greenfield, Mass.
Boston Scale & Machine Co., Boston, Mass.
Budd Ranney Engr. Co., Cleveland, Ohio.
Buffalo Pitts Co., Buffalo, N. Y.
Carpenter Mfg. Co., E. W., Bridgeport, Conn.
Columbus Die, Tool & Mach. Co., Columbus, O.
Cowdrey Mach. Works, C. H., Fitchburg, Mass.
Detroit Stamping Co., 951 W. Fort St., Detroit.
Dodge Tool Co., Grinnell, Iowa.
Federal Products Corp., Providence, R. I.
Feeney Tool Co., Bridgeport, Conn.
Ferracute Mach. Co., Bridgeton, N. J.
Gale-Sawyer Co., 33 Wormwood St., Boston.
Gem City Machine Co., Dayton, Ohio.
Gisholt Mach. Co., Madison, Wis.
Grant Mfg. & Mach. Co., Bridgeport, Conn.
Greenfield Tap & Die Corp., Greenfield, Mass.
Hartford Special Machy. Co., Hartford, Conn.
Krasberg Eng. & Mfg. Corp., Chicago, Ill.
Lincoln Mach. Co., Pawtucket, R. I.
MacCordy Tool & Die Co., Fulton, N. Y.
Marf Machine Co., 17 Vandewater St., N. Y. C.
Marvin & Casler Co., Canastota, N. Y.
Marvin Mfg. Co., W. B., Urbana, Ohio.
Mehl Mach. Tool & Die Co., Roselle, N. J.
Middletown F. & S. Co., Middletown, Conn.
Moback Tool & Mach. Mfg. Co., Boston, Mass.
Modern Tool Die Mach. Co., Columbus, Ohio.
Moody Tool Wks., Chas. J., Elgin, Ill.
Moore & Co., Chicago, Ill.
Mutual Mach. Co., 29 Wells St., Hartford, Conn.
Nelson Tool & Machine Co., Newark, N. J.
Nestor Mfg. Co., 40 W. 13th St., N. Y. City.
Parker Mach. Co., 221 High St., Boston.
Potter Tool & Mach. Wks., 79 E. 130, N. Y.
Premier Mach. Tool Wks., Albany, N. Y.
Reynolds Machine Co., Massillon, Ohio.
Reid Brothers Co., Beverly, Mass.
Rowbottom Mach. Co., Waterbury, Conn.
Service Engineering Co., N. Y. City.
Sheffield Mach. & Tool Co., Dayton, Ohio.
Simplex Tool Co., Woonsocket, R. I.
Sloan & Chace Mfg. Co., Newark, N. J.
Slocomb Co., J. T., Providence, R. I.
Slocum, Avram & Slocum Lab., Newark, N. J.
Spafford Tool Works, Hartford, Conn.
Starrett Co., L. S. Athol, Mass.
Steel Products Engineering Co., Springfield, O.
Superior Tool & Die Co., Chicago, Ill.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Terkelsen & Wennberg, Boston, Mass.
Toledo Mach. & Tool Co., Toledo, Ohio.
Union Tool Co., Orange, Mass.
Wade-American Precision Tool Co., Boston.
Walker Co., O. S., Worcester, Mass.
Waltham Mach. Wks., High St., Waltham, Mass.
Weber & Scher Mfg. Co., Newark, N. J.
West & Dodge Co., Boston, Mass.
Whiting & Comstock, Hartford, Conn.
Wilcox Motor & Mfg. Co., Saginaw, Mich.
Zumbach Machine Co., 134 W. 54th St., N. Y. C.

**Tools, Small (See Machinists' Small Tools)**

**Torches, Blow**
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.

**Transformers**
Crocker-Wheeler Co., Ampere, N. J.
General Electric Co., Schenectady, N. Y.
Westinghouse Elec. & Mfg. Co., E. Pittsburg, Pa.

**Transmission Machinery**
Caldwell & Son Co., H. W., Chicago, Ill.
Hyatt Roller Bearing Co., Harrison, N. J.
Jones Foundry & Machine Co., W. A., Chicago.
Link-Belt Co., Chicago, Philadelphia.
Moore & White Co., Phila., Pa.
Morse Chain Co., Ithaca, N. Y.
Rockwood Mfg. Co., Indianapolis, Ind.
Royersford Fdry. & Mach. Co., Royersford, Pa.

**Transportation System (See Trucks)**

**Trolleys and Tramways**
Chisholm-Moore Mfg. Co., Cleveland, Ohio.
Euclid Crane & Hoist Co., Euclid, Ohio.
Harrington, Son & Co., Edwin, Philadelphia, Pa.
Shepard Elec. C. & H. Co., Montour Falls, N. Y
Whiting Foundry Equipment Co., Harvey, Ill.
Yale & Towne Mfg. Co., 9 E. 40th St., N. Y. C.

**Truck Casters**
Hamilton Caster & Mfg. Co., Hamilton, Ohio.

**Trucks**
Lewis-Shepard Co., Boston, Mass.
Lyon Metallic Mfg. Co., Aurora, Ill.
New Britain Mach. Co., New Britain, Conn.
Stuebing Truck Co., Cincinnati, Ohio.
Transmission Ball Bearing Co., Buffalo, N. Y.
Whiting Foundry Equipment Co., Harvey, Ill.

# Oxweld

## Lowering Factory Costs

—only one of the things oxwelding accomplishes for production men that "produce."

Oxwelding cuts sales costs, too, because the product that is oxwelded is instantly recognized as stronger, more sightly, more saleable.

The fact that you can equip to Oxweld for a smaller investment than any other process entails, should make our Bulletins still more interesting. Better write for them. See the unique Injector Type Blowpipe and the remarkable work it is doing.

OXWELD ACETYLENE COMPANY
NEWARK, N. J. CHICAGO LOS ANGELES

*World's Largest Maker of Equipment for Oxwelding and Cutting Metals*

204

**Tube Machinery, Seamless and Welded**
Standard Engineering Wks., Ellwood City, Pa

**Tubing, Flexible**
Almond Mfg. Co., T. R., Ashburnham, Mass
Titeflex Metal Hose Corp., Newark, N. J.

**Tubing, Seamless Steel, Brass and Copper**
Blum & Co., Julius, 510-512 W. 24th St., N. Y. C.
National Tube Co., Pittsburgh, Pa.
Ward's Sons, Edgar T., Boston, Mass

**Turret Heads**
Almond Mfg. Co., T. R., Ashburnham, Mass.
Spafford Tool Works, Hartford, Conn.

**Turret Machines (See Lathes, Horizontal Turret)**

**Turrets, Tool Post**
American Tool Works Co., Cincinnati, Ohio.
Phoenix Mfg. Co., Eau Claire, Wis.

**Union, Pipe**
Dart Mfg. Co., E. M., Providence, R. I

**Universal Joints**
Baush Machine Tool Co., Springfield, Mass.
Bearings Co. of America, Lancaster, Pa.
Gray & Prior Mach. Co., Hartford, Conn.
Mutual Mach. Co., 29 Wells St., Hartford, Conn.
Universal Machine Co., Bowling Green, Ohio.

**Valves**
Elmes Engineering Works, Chas. F., Chicago, Ill
Metalwood Mfg. Co., Detroit, Mich.
Watson-Stillman Co., 42 Church St., N Y. City

**Varnishes**
Hilo Varnish Corporation, Brooklyn, N. Y

**Vise Stands**
New Britain Mach. Co., New Britain, Conn.
Western Tool & Mfg. Co., Springfield, Ohio.

**Vises, Drilling Machine**
American Pneumatic Chuck Co., Chicago, Ill.
Armstrong-Blum Mfg. Co., Chicago, Ill.
Armstrong Bros. Tool Co., Chicago, Ill.
Brown Engineering Co., Reading, Pa
Graham Mfg. Co., Providence, R. I.
Hartford Special Mchy. Co., Hartford, Conn.
Hoggson & Pettis Mfg. Co., New Haven, Conn.
Horton & Son Co., E., Windsor Locks, Conn.
Nestor Mfg. Co., 40 W. 13th St., N. Y. City.
Sanford Mfg. Co., F. C., Bridgeport, Conn.
Sprague-Hayes Machinery Co., Detroit.
Thomas Elevator Co. 20 S Hoyne Ave., Chicago

**Vises, Metal Workers'**
Athol Mach. Co., Athol, Mass
Fox Machine Co., Jackson, Mich.
Hammacher, Schlemmer & Co., New York City
New Britain Mach. Co., New Britain, Conn
Oliver Machinery Co., Grand Rapids Mich
Reed Mfg. Co., Erie, Pa.
Western Tool & Mfg. Co., Springfield, Ohio

**Vises, Milling Machine**
Brown & Sharpe Co., Providence, R. I.
Cincinnati Milling Machine Co., Cincinnati, Ohio
Cleveland Milling Mach. Co., Cleveland, Ohio.
Cochrane-Bly Co., Rochester, N. Y.
Edlund Machry. Co., Inc., Cortland, N. Y.
Greenfield Tap & Die Corp., Greenfield, Mass.
Hartford Special Mchy. Co., Hartford, Conn.
Moback Tool & Mach. Mfg. Co., Boston, Mass.
Nestor Mfg. Co., 40 W. 13th St., N. Y. City.
Sanford Mfg. Co., F. C., Bridgeport, Conn.
Standard Engineering Wks., Pawtucket, R. I.

**Vises, Pipe**
Athol Machine Co., Athol, Mass.
Butterfield & Co., Derby Line, Vt.
Greenfield Tap & Die Corp., Greenfield, Mass.
Reed Mfg. Co., Erie, Pa.
Saunders Sons, D., Yonkers, N. Y.
Western Tool & Mfg. Co., Springfield, Ohio.
Williams, & Co., J. H., Brooklyn, N. Y.

**Vises, Planer and Shaper**
American Tool Works Co., Cincinnati, Ohio.
Cincinnati Planer Co., Cincinnati, Ohio.
Cleveland Milling Mach. Co., Cleveland, Ohio.
Graham Mfg. Co., Providence, R. I.
Hartford Special Mchy. Co., Hartford, Conn.
Hendey Mach. Co., Torrington, Conn.
Hoggson & Pettis Mfg. Co., New Haven, Conn.
Moback Tool & Machine Mfg. Co., Boston, Mass.
Sanford Mfg. Co., F. C., Bridgeport, Conn.

**Vises, Universal Machine**
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling Mach. Co., Cincinnati, Ohio.
Hartford Special Mchy. Co., Hartford, Conn.
Hoggson & Pettis Mfg. Co., New Haven, Conn.
Horton & Son Co., E., Windsor Locks, Conn.
Kempsmith Mfg. Co., Station A, Milwaukee, Wis.
Moback Tool & Mach. Mfg. Co., Boston, Mass.
Nestor Mfg. Co., 40 W. 13th St., N. Y. City.
Sanford Mfg. Co., F. C., Bridgeport, Conn.
Skinner Chuck Co., New Britain, Conn.
Union Tool Co., Orange, Mass.

**Vises, Woodworkers'**
Hammacher Schlemmer & Co., New York City.

**Voltmeters**
Bristol Co., Waterbury, Conn.
Brown Instrument Co., Philadelphia, Pa.
General Electric Co., Schenectady, N. Y.
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa
Weston Elec. Instrument Co., Newark, N. J.

**Wagon Loaders**
Link-Belt Co., Chicago, Philadelphia.

**Wash Stands and Bowls**
Manufacturing Equipment & Engineering Co., Framingham, Mass.

**Washers**
Detroit Stamping Co., 951 W. Fort St., Detroit.
Kales Stamping Co., Detroit, Mich.
Standard Shop Equipment Co., Philadelphia, Pa.

**Welding, Electric**
Federal Machine & Welder Co., Warren, Ohio.
General Electric Co., Schenectady, N. Y.
Thomson Elec. Welding Co., Lynn, Mass.
Thomson Spot Welder Co., Lynn, Mass
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.

**Welding Filler Rods**
Page Steel & Wire Co., 30 Church St., N. Y. C.

**Welding, Oxy-Acetylene**
Davis-Bournonville Co., Jersey City, N. J.
Imperial Brass Mfg. Co., Chicago, Ill.
Oxweld Acetylene Co., Chicago, Ill.

**Welding Machines, Electric**
Electric Arc Cutting & Weld. Co., Newark, N. J.
Federal Machine & Welder Co., Warren, Ohio.
General Electric Co., Schenectady, N. Y.
Thomson Elec. Welding Co., Lynn, Mass.
Thomson Spot Welder Co., Lynn, Mass
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.

**Welding Machines, Oxy-Acetylene**
Davis-Bournonville Co., Jersey City, N. J.
Milburn Co., Alexander, Baltimore, Md
Oxweld Acetylene Co., Chicago, Ill.

**Welding Supplies**
Oxweld Acetylene Co., Chicago, Ill.
Tip-It, Inc., 120 Broadway, N. Y. C.

**Wheels, Industrial**
Brewster Co., Wm., 30 Church St., N. Y. City.
Carnegie Steel Co., Pittsburgh, Pa.

**Wire**
Boker & Co., H., 101 Duane St., N. Y. City.
D & W Fuse Co., Providence, R. I.
Gwilliam Co., 253 W. 58th St., New York City.
Halcomb Steel Co., Syracuse, N. Y.
Hammacher, Schlemmer & Co., New York City.
Hawkridge Bros. Co., 303 Congress St., Boston.
Page Steel & Wire Co., 30 Church St., N. Y. C.

**Wires, Special**
Driver-Harris Co., Harrison, N. J.

**Wire Straightening and Cutting Machinery**
Blake & Johnson Co., Waterbury, Conn.
Rowbottom Mach. Co., Waterbury, Conn.
Shuster Co., B. F., New Haven, Conn.
Worthington Pump & Mchy. Corp., N. Y. City.

**Wire Welding**
Federal Tool & Alloy Steel Corp., 12 Platt St., N.Y.
Page Steel & Wire Co., 30 Church St., N. Y. C

**Wood-Working Machinery**
Blount Co., J. G., Woodland St., Everett, Mass.
Greaves, Klusman Tool Co., Cincinnati, Ohio.
New Britain Machine Co., New Britain, Conn.
Oliver Machinery Co., Grand Rapids, Mich.
Rowbottom Mach. Co., Waterbury, Conn.
Seneca Falls Mfg. Co., Seneca Falls, N. Y.
Silver Mfg. Co., Salem, Mass.

**Worm Cutting Machines, Automatic**
Bilton Mach. Tool Co., Bridgeport, Conn.

**Wrenches, Drop Forged**
Armstrong Bros. Tool Co., Chicago, Ill.
Williams & Co., J. H., Brooklyn, N. Y.

**Wrenches, Machinist**
Hammacher, Schlemmer & Co., New York City.
Trimont Mfg. Co., 55 Amory St., Roxbury, Mass.
Williams & Co., J. H., Brooklyn, N. Y.

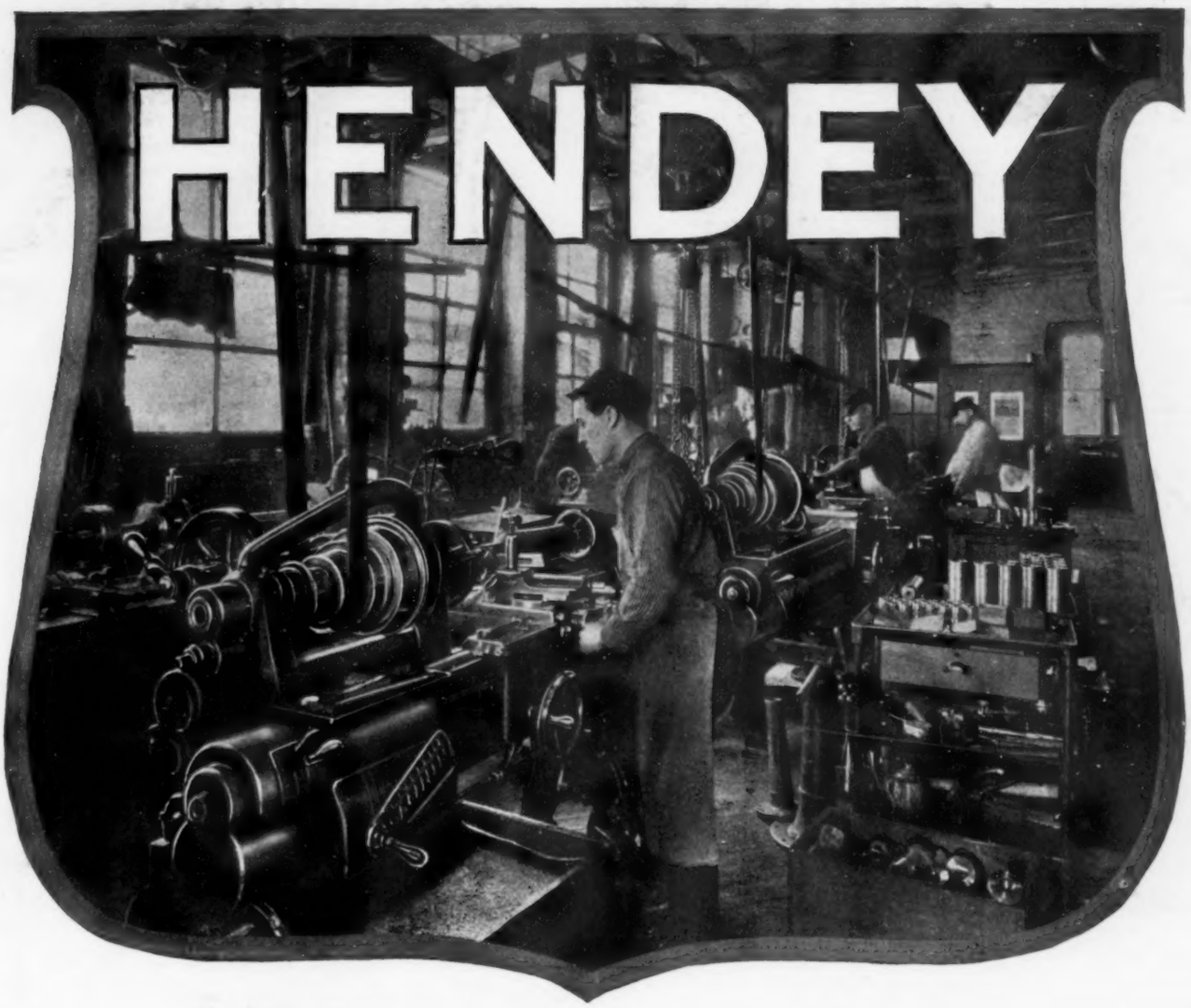
**Wrenches, Pipe**
Craftsman Tool Co., Conneaut, Ohio.
Greenfield Tap & Die Corp., Pipe Tool Division, Greenfield, Mass.
Moore Drop Forging Co., Springfield, Mass.
Trimont Mfg. Co., 55 Amory St., Roxbury, Mass.
Williams & Co., J. H., 35 Richards St., Brooklyn.

**Wrenches, Ratchet**
Pratt & Whitney Co., Hartford, Conn.
Starrett Co., L. S., Athol, Mass.

**Wrenches, Tap**
Bay State Tap & Die Co., Mansfield, Mass.
Butterfield & Co., Derby Line, Vt.
Card Mfg. Co., S. W., Mansfield, Mass.
Greenfield Tap & Die Corp., Greenfield, Mass.
Starrett Co., L. S., Athol, Mass.
Union Tool Co., Orange, Mass.
Williams & Co., J. H., 35 Richards St., Brooklyn.

## ALPHABETICAL INDEX TO ADVERTISERS—Continued from page 356


| | Page |
|---|---|
| Philadelphia Gear Works | 236 |
| Phoenix Mfg. Co. | 200 |
| Pittsburgh Mach. Tool Co. | 59 |
| Positions Vacant and Wanted | 320 |
| Porter-Cable Machine Co. | 197 |
| Potter & Johnston Machine Co. | 20, 21 |
| Potter Tool & Machine Works, S. A. | 198 |
| Powell Machine Co. | 134 |
| Pratt Chuck Co. | 258 |
| Pratt & Whitney Co. | 2nd Cover, 3 |
| Precision Castings Co., Inc. | 171 |
| Premier Machine Tool Wks. | 335 |
| Prentiss & Co., Henry | 196, 306 |
| P. W. V. Automatic Machine Corp. | 108 |
| Racine Tool & Machine Co. | 224 |
| Ransom Mfg. Co. | 154 |
| Reading Chain & Block Corp. | 189 |
| Reed Mfg. Co. | 253 |
| Reed-Prentice Co. | 124, 125 |
| Reid Brothers Co. | 287 |
| Reliance Electric & Engineering Co. | 152 |
| Reliance Steel & Tool Co. | 279 |
| Republic Creosoting Co. | 136 |
| Reynolds Machine Co., The | 282 |
| Rhodes Mfg. Co. | 139 |
| Rhoads & Sons, J. E. | 194 |
| Rich Tool Co. | 276 |
| Richards, Anson W. | 318 |
| Rickert-Shafer Co. | 138 |
| Rivett Lathe & Grinder Co. | 126, 127, 128, 129, 3rd Cover |
| Robbins, Gamewell & Co. | 331 |
| Rockford Lathe & Drill Co. | 203 |
| Rockford Milling Machine Co. | 144 |
| Rockford Tool Co. | 198 |
| Rockwood Mfg. Co. | 188 |
| Rogers Machine Tool Co., Inc. | 146 |
| Root Co., C. | 335 |
| Rossendale-Reddaway Belting & Hose Co. | 194 |
| Rothweiler & Co. | 137 |
| Rowbottom Machine Co. | 143 |
| Royersford Foundry & Machine Co. | 186 |
| Russell, Burdsall & Ward Bolt & Nut Co. | 234 |
| Russell Mfg. Co. | 191, 318 |
| Safety Emery Wheel Co. | 223 |
| Sanford Mfg. Co., F. C. | 254 |
| Saunders Sons, D. | 254 |
| Savage Co., Inc., W. J. | 228 |
| Schatz Mfg. Co. | 182 |
| Schieren Co., Chas A. | 194 |
| Schoonmaker & Sons, A. G. | 316 |
| Scully-Jones Co. | 261 |
| Searchlight Section | 300 |
| Sebastian Lathe Co. | 203 |
| Sellers & Co., Inc., Wm. | 222 |
| Sellew Machine Tool Co. | 149 |
| Seneca Falls Mfg. Co., Inc. | 106, 107 |
| Service Engineering Co. | 325 |
| Sheffield Machine & Tool Co. | 327 |
| Shepard Electric Crane & Hoist Co. | 296 |
| Shepard Lathe Co. | 202 |
| Shepherd Engineering Co. | 334 |
| Shore Instrument & Mfg. Co. | 289 |
| Shuster Co., F. B. | 231 |
| Sidney Machine Tool Co., The | 202 |
| Sigourney Tool Co. | 210 |
| Silver Mfg. Co. | 210 |
| Simonds Mfg. Co. Fitchburg, Mass | 227 |
| Simmon Machine Co. | 311 |
| Simplex Tool Co. | 281, 331 |
| Sipp Machine Co. | 211 |
| SKF Industries, Inc. | 29 |
| Skelton Tool Co. | 282 |
| Skinner Chuck Co. | 258 |
| Sloan & Chace Mfg. Co. | 147 |
| Slocum, Avram & Slocum Lab. | 330 |
| Slocomb Co., J. T. | 122, 123 |
| Smith & Hemenway Co., Inc. | 282 |
| Smith & Mills Company | 148 |
| Smith and Serrell | 194 |
| Smooth-On Mfg. Co. | 188 |
| South Bend Lathe Works | 254 |
| Souther Engineering Corp., Henry | 290 |
| Spafford Tool Works | 208 |
| Spaulding-Moss Co. | 254 |
| Sprague-Hayes Machy. Co. | 254 |
| Springfield Machine Tool Co. | 95 |
| Standard Electrical Tool Co. | 154 |
| Standard Engr. Works, Ellwood City | 190 |
| Standard Eng. Wks., Pawtucket | 345 |
| Standard Mach. Tool Co. | 315 |
| Standard Gauge Steel Co. | 160 |
| Standard Shop Eqipment Co. | 298 |
| Standard Tool Co., The | 95 |
| Stark Tool Co. | 200 |
| Starrett Co., L. S. | 117 |
| Steel Products Engineering Co. | 325 |
| Steel Treating Equipment Co. | 168 |
| Steinle Turret Machine Co. | 32 |
| Steptoe Co., The John | 149 |
| Sterling Grinding Wheel Co. | 228 |
| Stevens-Duryea Co. | 333 |
| Stewart Mfg. Corp. | 172 |
| Stickley Machinery Co., E. B. | 314 |
| Stockbridge Machine Co., The | 146 |
| Stocker-Rumely-Wachs Co. | 314 |
| Stoll Co., Inc., The D. H. | 250 |
| Stratton & Bragg Co., Inc. | 281, 333 |
| Strong, Carlisle & Hammond Co. | 174 |
| Stuebing Truck Co., Inc. | 188 |
| Superior Corundum Wheel Co. | 214 |
| Superior Tool & Die Works | 334 |
| Sweet & Doyle Fdry. & Mach. Co. | 328 |
| Swind Machinery Co. | 227 |
| Syracuse Sander Mfg. Co., Inc. | 223 |
| Taft-Peirce Mfg. Co. | 285 |
| Tate-Jones & Co., Inc. | 246 |
| Taylor & Fenn Co. | 217 |
| Taylor Instrument Cos. | 287 |
| Taylor Machine Co., The | 242 |
| Terkelsen & Wennberg | 262 |
| Texas Co., The | 241 |
| Thomas Elevator Co. | 255 |
| Thomrson & Son Co., Henry G. | 228 |
| Thomson Electric Welding Co. | 85 |
| Thomson Spot Welder Co. | 84 |
| Thwing Instrument Co. | 288 |
| Tip-It, Inc. | 169 |
| Titeflex Metal Hose Corp. | 194 |
| Tock Screw Mach. Products Corp. | 330 |
| Toledo Bridge & Crane Co. | 185 |
| Toledo Machine & Tool Co. | 246 |
| Toomey, Inc., Frank | 308 |
| Torrington Co., The | 283 |
| Townsend Mfg. Co., H. P. | 234 |
| Trahern Pump Co. | 247 |
| Transmission Ball Bearing Co., Inc. | 190 |
| Treadwell Engineering Co. | 148 |
| Trimont Mfg. Co. | 272 |
| Tucker, W. A., & C. F. | 226, 294 |
| Turner Machine Co. | 211 |
| Underwood Corp., H. B. | 290 |
| Union Drawn Steel Co. | 169 |
| Union Lathe Works | 196 |
| Union Mfg. Co. | 260 |
| Union Mfg. Co. | 334 |
| Union Tool Co. | 286 |
| Union Twist Drill Co. | 88, 89 |
| U. S. Electrical Tool Co. | 154 |
| Universal Boring Machine Co. | 271 |
| Universal Grinding Machine Co. | 109 |
| V and O Press Co. | 250 |
| Vanadium-Alloys Steel Co. | 158 |
| Vandyck Churchill Co., The | 226 |
| Van Dorn & Dutton Co. | 239 |
| Van Norman Machine Tool Co. | 38, 39 |
| Vesder Mfg. Co., The | 289 |
| Vibration Specialty Co. | 194 |
| Victor Saw Works | 226 |
| Victor Tool Co. | 279 |
| Vitrified Wheel Co. | 220 |
| Vixen Tool Co. | 279 |
| Volyum Pump Co. | 247 |
| Vonnegut Machinery Co. | 316 |
| Vulcan Crucible Steel Co. | 169 |
| Wade-American Tool Co. | 200 |
| Wahlstrom Tool Co. | 262 |
| Walker Co., O. S. | 260 |
| Walsh Machinery Co., M. J. | 314 |
| Waltham Machine Works | 142 |
| Want Ads | 320 |
| Wards Sons Co., Edgar T. | 156 |
| Warner & Swasey Co. | 78, 79 |
| Waterston, J. M. | 254 |
| Watson-Stillman Co. | 234 |
| Wausau Abrasives Co. | 221 |
| Wayne Machinery Co. | 315 |
| Wayne Oil Tank & Pump Co. | 291 |
| Weber & Scher Mfg. Co. | 335 |
| West & Dodge Co. | 284 |
| West Haven Mfg. Co. | 282 |
| West Tire Setter Co. | 250 |
| Westcott Chuck Co. | 260 |
| Western Machine Tool Works | 209 |
| Western Tool & Mfg. Co. | 279 |
| Westinghouse Electric & Mfg. Co. | 151 |
| Weston Electrical Instrument Co. | 288 |
| Wheel Truing Tool Co. | 282 |
| Whitcomb-Blaisdell Mach. Tool Co. | 22, 23 |
| White & Bagley Co., The | 292 |
| Whiting & Comstock | 288 |
| Whiting Foundry Equipment Co. | 138 |
| Whitney & Son, Baxter D. | 319 |
| Whitney Mfg. Co. | 113 |
| Whiton Machine Co., D. E. | 262 |
| Wickes Bros. | 196, 262 |
| Wickes Machinery Co. | 316 |
| Wilcox Motor & Mfg. Co. | 330 |
| Williams & Co., J. H. | 229 |
| Williams & Son, Inc. E. A. | 168 |
| Wilson & Co., Inc., T. A. | 154 |
| Wilmarth & Morman Co. | 219 |
| Wilton Tool & Mfg. Co. | 135 |
| Winter Bros. Co. | 82 |
| Winterer, Herman L. | 312 |
| Wisconsin Electric Co. | 215 |
| Wisconsin Miller Mfg. Co. | 146 |
| Wood Turret Machine Co. | 200 |
| Woods Engineering Co. | 223 |
| Woodward & Powell Planer Co. | 142 |
| Worcester Lathe Co. | 203 |
| Worcester Machine Screw Co. | 325 |
| Worcester Machine Works, Inc | 217 |
| Worthington Pump & Mach. Corp. | 244, 245 |
| Yale & Towne Mfg. Co. | 190 |
| Young, Corley & Dolan, Inc. | 280 |
| Zelnicker Supply Co., Walter A. | 314 |
| Zumbach Machine Co. | 331 |




# Think so Well of Them They Have 20

Here you see some Hendey Lathes in a corner of the plant of the Schutte & Koerting Company, Philadelphia, Pa.

There are twenty of them at work here, performing a lot of operations on valve seats.

These people say they find this lathe most efficient for this class of work. It stands first really in their estimation.

***How about putting some of these "quality first" tools, in your plant?***

## THE HENDEY MACHINE CO., TORRINGTON, CONN.

**New York Office: 901 Singer Bldg.**
**Rochester Office: 521 Cham. of Com. Bldg.**
**Chicago Office: 618 Washington Blvd.**
**Boston Office: Oliver Bldg.**

# ALPHABETICAL INDEX TO ADVERTISERS


| | Page |
|---|---|
| Abbott Ball Co. | 190 |
| Aborn Steel Co. | 166 |
| Abrasive Machine Tool Co. | 221 |
| Acklin Stamping Co. | 332 |
| Acme Die Casting Corp. | 173 |
| Acme Machinery Co., The | 149 |
| Acme Machine Tool Co., The | 51 |
| Adams Co., The | 36 |
| Adams Mfg. Co., O. R. | 119 |
| Advance Tool Co., The | 280 |
| Aetna Foundry & Machine Co. | 328 |
| Aetna Machinery Corp. | 315 |
| Albaugh-Dover Co. | 243 |
| Albro-Clem Elevator Co. | 242 |
| Allen Mfg. Co., Inc. | 283 |
| Allen, R. A. | 330 |
| Alling-Lander Co., Inc. | 242 |
| Allis-Chalmers Mfg. Co. | 153 |
| Almond Mfg. Co., T. R. | 261 |
| American Bronze Corp. | 4th Cover |
| American Chemical Paint Co. | 290 |
| American Gas Furnace Co. | 298 |
| American Gauge Co. | 286 |
| American Incandescent Heat Co. | 179 |
| American Machine Co. | 260 |
| American Machinery Exchange | 332 |
| American Pneumatic Chuck Co. | 258 |
| American Pulley Co. | 186 |
| American Saw & Mfg. Co. | 112 |
| American Swiss File & Tool Co. | 274 |
| American Tool Works Co. | 14, 15 |
| American Twist Drill Co. | 278 |
| American Vulcanized Fibre Co. | 172 |
| Ames Co., B. C. | 295 |
| Ams Machine Co., Max | 248 |
| Anderson Bros. Mfg. Co. | 251, 286 |
| Anderson Die Machine Co. | 254 |
| Angonia Mfg. Co. | 334 |
| Argulo Oilless Bearing Co. | 190 |
| Armstrong-Blum Mfg. Co. | 227 |
| Armstrong Bros. Tool Co. | 270 |
| Arnold Co., H. H. | 281 |
| Arrow Tool Co. | 333 |
| Athol Machine Co. | 253 |
| Atkins & Co., Inc., E. C. | 225 |
| Atlantic Mfg. Co., The | 325 |
| Atlas Crucible Steel Co. | 165 |
| Atlas Press Co. | 250 |
| Auburn Ball Bearing Co. | 182 |
| Automatic Machine Co., The | 143 |
| Axelson Machine Co. | 203 |
| Badger-Packard Machinery Co. | 309 |
| Badger Tool Co. | 282 |
| Baird Mach. Co., W. J. | 309 |
| Baird Pneumatic Tool Co. | 251 |
| Baker Bros. | 146 |
| Baldwin Chain & Mfg. Co. | 190 |
| Barber-Colman Co. | 76, 77 |
| Barbour, Love & Woodward | 304 |
| Barnes Co., W. F. & John | 33 |
| Barnes, Wm. O. | 228 |
| Barnes Drill Co., Inc. | 208 |
| Barnett Co., G. & H. | 112 |
| Bath & Co., Cyril J. | 313 |
| Baush Machine Tool Co. | 204 |
| Bay State Stamping Co. | 292 |
| Bay State Tap & Die Co. | 339 |
| Beaman & Smith Co. | 260 |
| Bearings Co. of America, The | 182 |
| Beaudry & Co., Inc. | 248 |
| Becker Milling Machine Co. | 99, 335 |
| Bennett, W. R. Co., The | 179 |
| Bennett Mach'y Co., G. I. | 317 |
| Berggren & Pearson Mach. Co. | 337 |
| Bertolette Mach. Tool Co. | 315 |
| Besly & Co., Chas. H. | 220 |
| Best, Inc., W. N. | 293 |
| Betts Machine Co. | 9, 40 |
| Bickford Co., H. | 211 |
| Bicknell-Thomas Co. | 287 |
| Bignall & Keeler Machine Works | 148 |
| Bilgram Machine Works | 230 |
| Bilton Mach. Tool Co. | 144 |
| Birdsboro Steel Foundry & Mach. Co. | 188 |
| Black & Decker Mfg. Co. | 152 |
| Blair Tool & Machine Wks. | 325 |
| Blake & Johnson Co. | 223 |
| Blanchard Machine Co. | 141 |
| Blevney Machine Co. | 290 |
| Bliss Co., E. W. | 249 |
| Blount Co., J. G. | 223 |
| Blum & Co., Julius | 166 |
| Boker & Co., Inc., H. | 351 |
| Bond Foundry & Machine Co. | 188 |
| Boston Gear Works | 243 |
| Boston Scale & Mach. Co. | 286 |
| Boston Tool & Mfg. Co., Inc. | 289 |
| Bowen Products Corp. | 292 |
| Bowser & Co., Inc., S. F. | 292 |
| Boye & Emmes Machine Tool Co. | 341 |
| Bradford Machine Tool Co. | 5 |
| Bradley & Son, C. C. | 248 |
| Brady Foundry Co., Jas. A. | 328 |
| Brewster Co., Inc., Wm. | 289 |
| Bristol Co. | Fourth Cover |
| Bristol Machine Tool Co. | 207 |
| Broadway Machinery Co. | 310 |
| Brock Jr. Tool & Mfg. Works, Arthur | 326 |
| Brown Co., A. F. | 158 |
| Brown Engineering Co. | 246 |
| Brown Instrument Co. | 278 |
| Brown Mfg. Co., Arthur S. | 190 |
| Brown & Sharpe Mfg. Co. | 114, 115 |
| Brownell Machinery Co. | 301 |
| Brubaker & Bro., W. L. | 161 |
| Bryant Chucking Grinder Co. | 55 |
| Buckeye Engine Co., The | 262 |
| Buckeye Twist Drill Co. | 276 |
| Budd-Ranney Engineering Co. | 334 |
| Buffalo Pitts Co. | 332 |
| Bullard Machine Tool Co. | 71, 72, 73, 74, 75 |
| Bunting Brass & Bronze Co., The | 168 |
| Burke Machine Tool Co. | 146 |
| Butterfield and Co. | 116 |
| Cadillac Tool Co. | 208 |
| Caldwell & Son Co., H. W. | 189 |
| Calumet Iron & Metal Co. | 314 |
| Cambria Steel Co. | 164 |
| Camden Forge Company | 157 |
| Canton Fdry. & Machine Co., The | 169 |
| Carborundum Co. | 213 |
| Card Mfg. Co., S. W. | 60, 61 |
| Carlton Machine Tool Co., The | 218 |
| Carnegie Steel Co. | 162 |
| Carpenter Tew Gear Co. | 234 |
| Carpenter Mfg. Co., E. W. | 334 |
| Carroll-Jamieson Machine Tool Co. | 203 |
| Carter & Hakes Mach. Co. | 148 |
| Case Crane & Engineering Co. | 190 |
| Cashman Tool Co. | 280 |
| Champion Tool Wks. Co. | 112 |
| Chesapeake Iron Works, The | 186 |
| Chicago Flexible Shaft Co. | 175 |
| Chicago Machine Tool Co. | 147 |
| Chicago Pneumatic Tool Co. | 233 |
| Chicago Rawhide Mfg. Co. | 242 |
| Chisholm-Moore Mfg. Co., The | 190 |
| Cincinnati Automatic Machine Co. | 52 |
| Cincinnati Bickford Tool Co. | 10, 11 |
| Cincinnati Electrical Tool Co. | 154 |
| Cincinnati Gear Co. | 242 |
| Cincinnati Grinder Co., The | 222 |
| Cincinnati Lathe & Tool Co. | 202 |
| Cincinnati Milling Machine Co. | 6, 7 |
| Cincinnati Planer Co. | 52, 53, 317 |
| Cincinnati Pulley Machinery Co. | 208 |
| Cincinnati Shaper Co. | 64 |
| Clark Electric Co., Inc., Jas., Jr. | 154 |
| Clark Equipment Co. | 278 |
| Cleveland Automatic Machine Co. | 26, 27 |
| Cleveland Machine Tool Co. | 149 |
| Cleveland Milling Machine Co. | 149 |
| Cleveland Osborn Mfg. Co. | 170 |
| Cleveland Planer Co. | 149 |
| Cleveland Pneumatic Tool Co. | 235 |
| Cleveland Twist Drill Co. | 120 |
| Cleveland Worm Gear Co. | 243 |
| Clough, R. M. | 238 |
| Coats Machine Tool Co., Inc. | 288 |
| Cochrane-Bly Co. | 286 |
| Colburn Machine Tool Co. | 62, 63 |
| Colonial Steel Co. | 167 |
| Columbia Machine Tool Co., The | 148 |
| Columbia Steel & Shafting Co. | 167 |
| Columbus Brass Co. | 325 |
| Columbus Die, Tool & Machine Co. | 332 |
| Conc Automatic Mach. Co., Inc. | 145 |
| Contract Work | 325 |
| Cook Co., Asa S. | 254 |
| Cook & Co., Chas. A. | 290 |
| Corbin Screw Corp. | 335 |
| Cotton, Inc., H. W. | 328 |
| Cowdrey Machine Works, C. H. | 333 |
| Cowles Tool Co. | 276 |
| Crafts & Co., Arthur A. | 112 |
| Craftsman Tool Co. | 278 |
| Crawford Machine Tool Co. | 203 |
| Crocker-Wheeler Co. | 154 |
| Crofoot Gear Works | 243 |
| Cullman Wheel Co. | 222 |
| Curtis & Curtis Co., The | 149 |
| Cushman Chuck Co. | 259 |
| Cutter & Wood Supply Co. | 281 |
| C. W. Engineering Co. | 331 |
| Cyclops Steel Co. | 163 |
| D & W Fuse Co. | 256 |
| Dale-Brewster Machinery Co., Inc. | 207, 303 |
| Dallett Co., Thos. H. | 332 |
| Dalton Manufacturing Corp. | 200 |
| Dart Mfg. Co., F. M. | 290 |
| Davenport Machine Tool Co. | 148 |
| Davis Boring Tool Co. | 105 |
| Davis-Bournonville Co. | 168 |
| Davis Mach. Tool Co., Inc. | 81 |
| Day Machinery Co. | 315 |
| Defiance Machine Works | 58 |
| Delta File Works | 282 |
| Dennett, George | 314 |
| Desmond-Stephan Mfg. Co. | 222 |
| Detroit Reamer & Tool Co. | 274 |
| Detroit Stamping Co. | 194 |
| Detroit Tool Co. | 275 |
| Detroit Twist Drill Co. | 265 |
| Dexter Co., Inc., I. H. | 190 |
| Diamond Machine Co. | 220 |
| Diamond Saw & Stamping Works | 226 |
| Dickinson, Thomas I. | 112 |
| Dill Slotter People, The | 56 |
| Dodge Tool Co. | 335 |
| Doehler Die-Casting Co. | 173 |
| Dorman, John H. & Son | 280 |
| Draper & Maynard Co., The | 222 |
| Droges Machine Tool Co. | 28 |
| Driver-Harris Co. | 172 |
| DuPont Chemical Co. | 305 |
| Earle Gear & Machine Co. | 250 |
| Eastern Machinery Co. | 316 |
| Eastern Machine Screw Corp. | 263 |
| Eastern Tube & Tool Co. | 261 |
| Eclipse Fuel Engineering Co. | 162 |
| Economy Tool Holder Co. | 277 |
| Edlund Machinery Co., Inc. | 210 |
| Electric Arc Cutting & Welding Co. | 164 |
| Elmes Engineering Works, Chas. F. | 235 |
| Emery, A. H. | 334 |
| Engelhard, Chas. | 288 |
| Engravers & Printers Machine Co. | 179 |
| Ericsson Screw Mach. Products Co. | 335 |
| Erie Foundry Co. | 250 |
| Errington, F. A. | 261 |
| Euclid Crane & Hoist Co. | 189 |
| Evans Friction Cone Co. | 189 |
| Evans Stamping & Plating Co. | 210 |
| Factory & Mill Supply Co. | 312 |
| Fafnir Bearing Co., The | 182 |
| Fales Machinery Co., C. E. | 316 |
| Farrel Foundry & Machine Co. | 173 |
| Fawcus Machine Co. | 242 |
| Federal Bearings Co., Inc., The | 189 |
| Federal Machine & Welder Co. | 86 |
| Federal Mach'y Sales Co. | 318 |
| Federal Products Corp. | 267 |
| Federal Tool & Alloy Steel Corp. | 166 |
| Feeney Tool Co., The | 332 |
| Fellows Gear Shaper Co. | 16, 17 |
| Ferracute Machine Co. | 250 |
| Firth-Sterling Steel Co. | 165 |
| Fischer Machine Co. | 293 |
| Fiske Bros. Refining Co. | 293 |
| Fitchburg Grinding Machine Co. | 110 |
| Fitchburg Machine Works | 111 |
| Flather & Co., Inc. | 137 |
| Flather Mfg. Co., The | 242 |
| Flexible Steel Lacing Co. | 195 |
| Fooke Bros. Gear & Machine Co. | 240 |
| Forbes & Myers | 190 |
| Ford Chain Block & Mfg. Co. | 184 |
| For Sale | 300 |
| Fosdick Machine Tool Co. | 208 |
| Foster Machine Co. | 65, 66, 67 |
| Fox Machine Co. | 207 |
| Francis & Co. | 283 |
| Franklin Mfg. Co. | 173 |
| Franklin Machine Co. | 333 |
| Fulflo Pump Co., The | 222 |
| Gale-Sawyer Co., Inc. | 275 |
| Ganschow Co., Wm. | 243 |
| Gardner-Bryan Co., The | 282 |
| Gardner Machine Co. | 228 |
| Garvin Machine Co. | 286, 349 |
| Geier Co., The P. A. | 346 |
| Gelb & Co., J. | 310 |
| Gem City Machine Co. | 330 |
| Gem Mfg. Co. | 292 |
| General Electric Co. | 150, 238 |
| General Machine Works | 334 |
| Geometric Tool Co., The | 46, 47 |
| Gerstner & Sons, H. | 290 |
| Giddings & Lewis Mfg. Co. | 69 |
| Gilbert & Barker Mfg. Co. | 104, 177 |
| Gisholt Machine Co. | 91, 92, 93, 94 |
| Gits Bros. Mfg. Co. | 294 |
| Gleason Works | 231 |
| Goddard Tool Co. | 68 |
| Gooley & Edlund, Inc. | 147 |
| Gorham Tool Co. | 282 |
| Gorton Machine Co., Geo. | 289 |
| Gould & Eberhardt | 96, 97 |
| Graham Mfg. Co. | 252 |
| Grand Rapids Grinding Mach. Co. | 221 |
| Grant Gear Works | 242 |
| Grant Mfg. & Machine Co. | 230 |
| Graton & Knight Mfg. Co. | 195 |
| Graves Machinery Exchange | 302 |
| Gray Co., The, G. A. | 28 |
| Gray & Prior Machine Co. | 188 |
| Greaves-Klusman Tool Co. | 50 |
| Greaves Machine Tool Co., The | 202 |
| Green Rail & Mchy. Co. L. A. | 317 |
| Greenfield Machine Co. | 222 |
| Greenfield Tap & Die Corporation | 269 |
| Grove Mfg. Co. | 288 |
| Grover File Co. | 280 |
| Gurney Ball Bearing Co. | 57 |
| Gwilliam Co., The | 190 |
| Halcomb Steel Co. | 166 |
| Hall Gas Engine Co., The | 148 |
| Hall Mfg. Co., The | 283 |
| Hamilton Caster & Mfg. Co. | 186 |
| Hamilton Machine Tool Co. | 54 |
| Hammacher, Schlemmer & Co. | 345 |
| Hammond Mfg. Co., The | 210 |
| Hampden Corundum Wheel Co. | 222 |
| Hanscom Cutter Works | 282 |
| Harrington Son & Co., Edw. | 184, 206 |
| Harris Bros. Co. | 312 |
| Hart Roller Bearing Co. | 180 |
| Hartford Machine Screw Co. | 331 |
| Hartford Special Machinery Co. | 252, 335 |
| Hawkridge Bros. Co. | 165 |
| Heald Machine Co. | 31 |
| Hendey Machine Co. | 355 |
| Henry & Wright Mfg. Co. | 206 |
| Herbert, Ltd., Alfred | 176 |
| Hermance Machine Co. | 328 |
| Hess Steel Corporation | 168 |
| Hill, Clarke & Co., Boston | 307 |
| Hill, Clarke & Co., of Chicago | 300 |
| Hilliard Clutch & Machinery Co. | 190 |
| Hilo Varnish Corp. | 294 |
| Hoefer Mfg. Co. | 216 |
| Hoevel Mfg. Co. | 235 |
| Hoggson & Pettis Mfg. Co. | 259 |
| Holtzer-Cabot Electric Co., The | 154, 172 |
| Hooth & Stewart | 335 |
| Hoover Steel Ball Co. | 337 |
| Horsburgh & Scott Co. | 240 |
| Horton & Son Co., E. | 256 |
| Hudson Pump Co. | 250 |
| Humphrey Die & Tool Corp. | 334 |
| Hunter Saw & Machine Co. | 226 |
| Hurlbut-Rogers Machinery Co., The | 250 |
| Hyatt Roller Bearing Co. | 44, 45 |
| Hydraulic Press Mfg. Co. | 203 |
| Ideal Bronze Co. | 331 |
| Ideal Machinery Co. | 314 |
| Ideal Tool & Mfg. Co. | 281 |
| Imperial Brass Mfg. Co. | 168 |
| Independent Pneumatic Tool Co. | 234 |
| Industrial Machinery Corp. | 314 |
| Ingersoll Milling Machine Co. | 8 |
| Ingersoll-Rand Co. | 232 |
| Ingle Machine Co. | 83 |
| International Machine Tool Co. | 148 |
| International Nickel Co. | 168 |
| International Time Recording Co. | 133 |
| Jacobs Mfg. Co. | 299 |
| Jessop & Sons, Inc., Wm. | 165 |
| Johansson, Inc., C. E. | 101 |
| Johnson Gas Appliance Co. | 179 |
| Johnson Machine Co., Carlyle | 100 |
| Johnston & Jennings Co., The | 334 |
| Jones Foundry & Machine Co., W. A | 240 |
| Jones & Lamson Machine Co. | 12, 13, 112 |
| Jones-Motros, Inc. | 288 |
| Kaies Stamping Co., The | 298 |
| Kearney & Trecker Co. | 70 |
| Kell, Hock & Co. | 282 |
| Keller Mech. Engraving Co. | 290 |
| Kelly Co., R. A. | 282 |
| Kelly Reamer Co., The | 280 |
| Kempsmith Mfg. Co. | 40, 41 |
| Keystone Reamer & Tool Co. | 268 |
| King Machine Tool Co. | 49 |
| Kinsey Co., F. A. | 316 |
| Knight Machinery Co., W. B. | 206 |
| Knoeppel & Co. Inc. C. E. | 290 |
| Krasberg Engineering & Mfg. Corp. | 329 |
| Ladew Co., Inc., Edwin R. | 192 |
| Lamberg & Co., A. | 313 |
| Lambert & Todd Mach. Co. | 332 |
| Laminated Shim Co. | 282 |
| Lancaster Foundry Co. | 332 |
| Landis Machine Co. | 24 |
| Landis Tool Co. | 102, 103, 138 |
| Langelier Mfg. Co. | 202 |
| La Pointe Mfg. Co., V. E. | 202 |
| Lapointe Co., J. N. | 121 |
| Lapointe Machine Tool Co. | 130, 131 |
| LaSalle Tool Co. | 214 |
| Latrobe Electric Steel Co. | 167 |
| Latrobe Tool Co. | 187 |
| Leibond Machine Tool Co., The R. K. | 35 |
| Lees-Bradner Co. | 87 |
| Leland-Gifford Co. | 211 |
| Lewis-Shepard Co. | 190 |
| Liberty Machine Tool Co., The | 140 |
| Light Mfg. & Foundry Co. | 172 |
| Lincoln Machine Co. | 325 |
| Lincoln Twist Drill Co., The | 132 |
| Link-Belt Co. | 193 |
| Lodge & Shipley Machine Tool Co. | 4 |
| Lowry-Knise Tool Co. | 284 |
| Lovejoy Tool Co. | 273 |
| Lucas Machine Tool Co. | 48 |
| Ludlum Steel Co. | 159 |
| Lumen Bearing Co. | 181 |
| Lynd-Farquhar Co. | 205, 306 |
| Lyon Metallic Mfg. Co. | 172 |
| McDonough Mfg. Co. | 212 |
| McGraw-Hill Book Co., Inc. | 178, 228 |
| McMullen Machinery Co. | 310 |
| MacCordy Tool & Die Co. | 331 |
| Machine Products Co., The | 230 |
| Manufacturers Hardware Corp. | 281 |
| Manufacturing Equipment & Engineering Co. | 155 |
| Marf Machine Co., Inc. | 172, 330 |
| Marshall & Huschart Machinery Co. | 310 |
| Marvin Mfg. Co., W. B. | 333 |
| Marvin & Casler Co. | 266 |
| Massachusetts Oilless Bearings Co. | 180 |
| Maute & Sons, J. | 330 |
| Maxf Grinding Wheel Corp. | 228 |
| Meacham Gear Corp. | 237 |
| Mehl Machine Tool & Die Co. | 331 |
| Meisel Press Mfg. Co. | 242 |
| Meisselbach-Catucci Mfg. Co. | 242 |
| Metalwood Mfg. Co. | 234 |
| Michigan Lubricator Co. | 294 |
| Michigan Machine Co. | 145 |
| Michigan Tool Co. | 264 |
| Middletown Fire Arms & Specialty Co. | 330 |
| Midvale Steel & Ordnance Co. | 164 |
| Milburn Co., The Alex. | 172 |
| Millholland Machine Co., W. K. | 201 |
| Moback Tool & Machine Mfg. Co. | 252 |
| Modern Machine & Pattern Co. | 333 |
| Modern Machinery Exchange | 317 |
| Modern Tool Co. | 347 |
| Modern Tool Die Machine Co. | 335 |
| Moline Tool Co. | 210 |
| Moltrup Steel Products Co. | 164 |
| Monarch Machine Tool Co. | 199 |
| Moody Tool Wks., Chas. J. | 328 |
| Moore & Co. | 334 |
| Moore & White Co., The | 184 |
| Moore Drop Forging Co. | 272, 328 |
| Morey & Co. | 302, 315 |
| Morris Machinery Co. | 315 |
| Morris Machine Tool Co., The | 211 |
| Morse Chain Co. | 183 |
| Morse Twist Drill & Machine Co. | 341 |
| Morton Machinery Co. | 318 |
| Morton Mfg. Co. | 250 |
| Motch & Merryweather Mchry. Co. | 307 |
| Mueller Machine Tool Co. | 210 |
| Munson, E. G. | 335 |
| Murchey Mach. & Tool Co. | 98 |
| Mutual Machine Co. | 194 |
| National Acme Co. | 34, 42 |
| National Automatic Tool Co. | 80 |
| National Lead Co. | 168 |
| National Machine Tool Co. | 149 |
| National Machinery Co. | 148 |
| National Tool Co., The | 277 |
| National Tube Co. | 168 |
| Nazel Engineering & Mach. Works | 246 |
| Neil & Smith Electric Tool Co. | 154 |
| Nelson-Blanck Mfg. Co. | 210 |
| Nelson Tool & Machine Co. | 297 |
| Nestor Mfg. Co. | 252 |
| Newark Gear Cutting Machine Co. | 230 |
| New Britain Machine Co. | 25, 148 |
| New Departure Mfg. Co. | 37 |
| New England Drawn Steel Co. | 168 |
| Newton Machine Tool Works, Inc. | 18, 19 |
| New York Leather Belting Co. | 195 |
| New York Machinery Exchange | 311 |
| Niagara Machine & Tool Works, Inc. | 248 |
| Nicholson File Co. | 343 |
| Nicholson & Co., W. H. | 278 |
| Noble & Westbrook Mfg. Co. | 246 |
| Norma Co. of America | 182 |
| Northern Engineering Works | 188 |
| Norton Co. | 118, 119 |
| Oakley Chemical Co. | 294 |
| Oakley Machine Tool Co., The | 216 |
| Oesterlein Machine Co. | 90 |
| Ohio Machine Tool Co. | 30 |
| Oil & Waste Saving Machine Co. | 246 |
| Oliver Machinery Co. | 290 |
| Oliver Mfg. Co., W. W. | 242 |
| Onondaga Steel Co., Inc. | 169 |
| Osborne & Sexton Machy Co. | 317 |
| Ott Grinder Co. | 218 |
| Oxweld Acetylene Co. | 353 |
| Page Steel & Wire Co. | 169 |
| Pangborn Corporation | Front Cover |
| Pannier Bros. Stamp Co., Inc. | 283 |
| Parker Machine Co. | 273 |
| Pawling & Harnischfeger Co. | 188 |
| Paxson Co., J. W. | 234 |
| Pedrick Tool & Machine Co. | 282 |
| Peerless Machine Co. | 226 |
| Persons-Arter Machine Co. | 228 |
| Peter Bros. Mfg. Co. | 262 |


(Continued on page 354)